. XXXIV. January, 1908 No. I.

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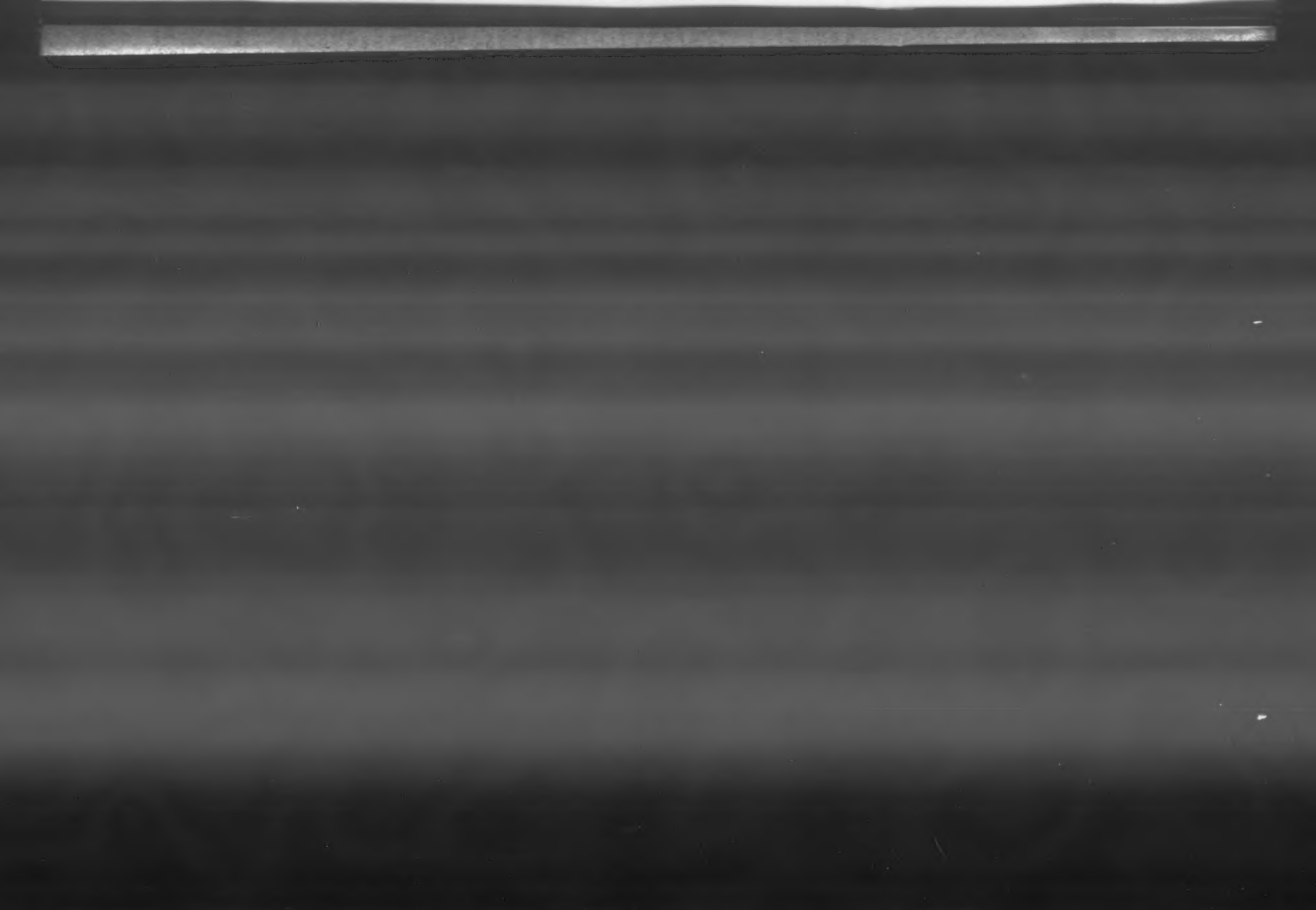


MUNICIPAL ENGINEERING

VOLUME XXXIV. JANUARY, NINETEEN HUNDRED EIGHT. NUMBER ONE.

WATER CHARGES AND WATER WASTE AT SOMERVILLE, MASS.

Somerville, Mass., is a city of 70,000 population with an average daily consumption of 89 gallons of water per capita. The supply is obtained from the Metropolitan district system and the assessment from that system for the supply has increased to $97,160 a year, with a prospect of further increase on account of the change in method of assessment whereby Boston pays at the same rates as the other cities and towns in the district, namely, one-third on the basis of the city's valuation and two-thirds on its consumption of water. The total cost of waterworks maintenance and operation, extensions (nearly $20,000) and interest and bonds (nearly $10,000) was $157,392 during the year. The total net income was $234,300. The excess of income over expenditures was applied to sewer maintenance, sewer bonds and interest (nearly $39,000), fire department ($24,500), city debt (nearly $11,000), and $1,000 contribution to the fight against gypsy moths.

The total cost of the waterworks has been $874,698, including the $20,000 expended for extensions out of the income for the year of the report. The city pays nothing for water for city department purposes, estimated to be worth $12,000. The $38,000, the sum of the cost of extensions, water bonds retired and free water is a large allowance for depreciation and sinking fund. Water rates could therefore be reduced one-third and still the department would pay its own way in full. All of the population is supplied with water, but the water users pay bills nearly 60 per cent. higher than they would be if the water department were not used to reduce the taxes by the $12,000 free water and the $77,000 paid to other city accounts. In other words the user of water is paying a large proportion of the fire protection cost of his neighbor with high property valuation and small use of water. If he knew this would he not consider it unfair?

If the same basis for charges which is used by the Metropolitan District in making its assessments should be applied to the Somerville distribution, two-thirds of the total cost of the system and its operation, would be assessed upon the water users, practically in proportion to their use of water, and the other third would be assessed upon the property of the city in proportion to its value, presumably in the form of a regular tax.

The evidence regarding the propriety of changing the distribution of Somerville's own charges for water and the theory of the law regarding the distribution of the Metropolitan District charges are seen to be in remarkably close agreement, and this fact gives the user of water legal authority for considering the present method of charging for water unfair.

The charges for water being assessed by the Metropolitan Water Board partly on the basis of consumption of water, all the water delivered to the city of Somerville is metered. This gives an opportunity for an interesting comparison from which the relative amounts of wasted water and useful water may be shown. The accompanying chart, for the use of which we are indebted to Water Commissioner Frank E. Merrill, indicates graphically the consumption of water in this city during the years 1905 and 1906 on both the high-service and low-service systems. The full line represents the average daily consumption of water, and the dotted line the average daily rate of consumption during the period of minimum use or between the hours of one and five in the morning. The difference of the quantities indicated as average daily consumption and minimum flow shows clearly that a large quantity of water is lost through defective pipes and fixtures,

and, especially in the cold months, through allowing water to run to waste to prevent freezing. In the high-service system the line commences the year at an average daily consumption of 1,340,000 gallons, and closes at 1,420,000, with a minimum of 1,260,000 gallons on June 30. The night flow of water is more regular, starting the year at an average of 840,000 gallons per day, and closing at the same figure, with a minimum of 640,000 on November 17, and a maximum of 940,000 February 10. The large increase in consumption commencing May 10 is undoubtedly due to the commercial use of water by a railway company for the time being, and is not expected to continue. In the low-service system the 1906 consumption starts at an average of 4,700,000 gallons per day, and closes the year at 4,900,000, with a minimum of 4,200,000 March 17, and a maximum of 5,700,000 during the cold period of December 15, while the minimum line reaches its lowest point November 3 at 2,200,000, and its highest during the cold season of January and February at 4,000,000.

Since two-thirds of the cost of water to Somerville is strictly according to the amount of water used, a reduction in waste results in an immediate reduction in cost of water. This would seem, therefore, to be an ideal city to which to apply a meter system and study its effect upon the economics of the waterworks management. About 25 per cent of the services in Somerville are now metered and the average consumption is 89 gallons per capita per day. Six of the cities in the Metropolitan District have a higher rate of consumption, running from 97 to 113 gallons for the smaller cities and 151 gallons for Boston. Nine of the cities in the district have a per capita conspmption of 49 to 82 gallons a day and the statement is made that the cities which are largely metered have the smallest per capita consumption of water. If we assume that only half of the minimum flow shown on the diagram is waste, still about one-third of the water paid for by the city is wasted. If this were saved the city would save over $20,000 a year which it now pays, since it would save one-third the water and two-thirds of the amount it pays the Metropolitan district is based on the amount of water taken. The city has 11,489 taps, of which 2,829 are now metered, leaving 8,660 taps to meter. The saving in one year would go far toward putting meters on all services. The per capita consumption would then be third in the list of well metered towns with only Milton, 49 gallons, and Madden, 51 gallons per capita per day, below it in consumption.

This is one line of analysis, possibly the readers of this article may have others to present. This is a live subject and is well worthy of full and careful discussion.

ARTISTIC TREATMENT OF REINFORCED CONCRETE.

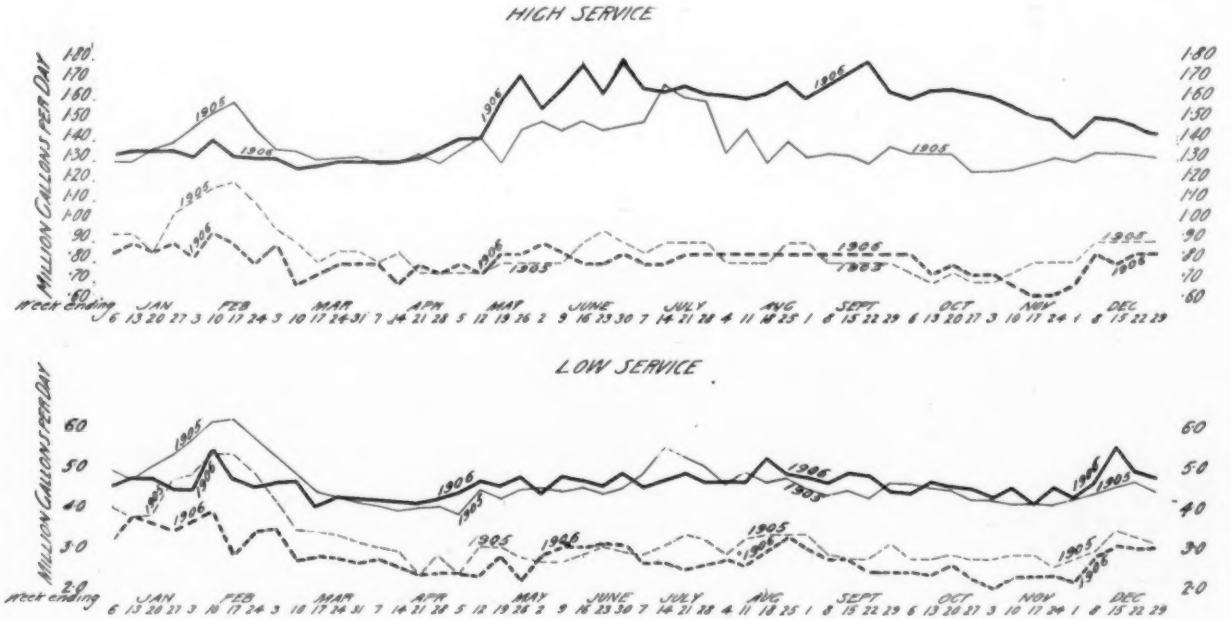
*By A. O. Elsner, Architect, Cincinnati, O.**

The mere contemplation of this subject, so large in its scope and yet so little exploited, makes a writer feel like a traveler in a new land. It is hard to know where to begin and where to end; whether to follow the line of least resistance and make it a general or a detailed review of accomplished results, or, taking courage, to strike out boldly, discover motives, express opinions, and generally lay down the law.

The one course would scarcely be appropriate here, because it requires no combined effort. The other course is full of danger and, pursued alone, would consume too much time and invite too much criticism. Let us, therefore, take some of each with moderation, and see whether we cannot produce a monolithic structure, with a mixture of one part good fellowship, thoroughly seasoned and tested according to the Institute standard, two parts clean, sharp sand and four parts unscreened crushed hopes and ideals, wet-mix, and thoroughly tamp to place.

Above all, this discussion should properly be confined to concrete used structurally, having in view the possibilities of a constructive architecture rather than a mere application of structural decoration. Proceeding

*A paper for the American Institute of Architects.



WATER CONSUMPTION IN SOMERVILLE DURING YEARS 1905 AND 1906
Full line shows Average Rate, Dotted Line shows Minimum Rate.

upon this basis, we may at once eliminate all consideration of concrete blocks and artificial stone, inasmuch as these products, being mere substitutes for brick and stone, and being used in the same manner, do not affect the status of our art, but leave it just what it has been from the beginning, a gravity architecture, if this term may be used.

The great antiquity of concrete as a building material would justify a search for early examples of its use in architectural expression. But apparently this remarkable material, which, after all, is only just beginning to reveal its ultimate possibilities, was used by the ancients only for the baser purposes of piling up masses of masonry, or at best as a backing for stone and marble facings. The first suggestion of its fitness for artistic expression came when the builders of the Renaissance undertook to construct their architectural features of cement mortar.

There is undoubtedly a great fascination in being able to mold as thoroughly plastic material as cement mortar into any desirable form, or even to shape it by hand before it sets up hard, and so produce creditable work of decorative sculpture. In fact this is being done rather extensively even at the present day. But one invariably suffers a genuine shock upon discovering that a thing is not what it seems, and that beautiful, stately colonnades or arcades and porticoes, well designed and in style, are not built of stone as one naturally expects to find them, but that it is all a sham; that we are looking at a thin veneer of cement mortar, which at best, is but a temporary device, a sort of makeshift, calculated to mislead and deceive. But during this period of development, while architects were being led to adopt new materials, they did not concern themselves with the evolution of design in conformity with their new materials, and it followed quite naturally that no progress was being made toward the realization of a concrete architecture. In fact no attempt was apparently made in this direction.

It would be difficult to estimate the power or extent of Ruskin's influence in bringing about a restoration of truthfulness in design. While it cannot be said to have extensively effected immediate and tangible results, it did set men to thinking, and it is only in recent years, within the present generation, in fact, that this subtle influence is gradually asserting itself, and naturally bringing about a renewal of real, artistic inspiration.

It is hard to depart from beaten paths, and men, as a rule, will not and dare not, until some genius boldly cuts a new way. It is hard to give up the old familiar forms that have become a veritable architectural alphabet, which seems to most of us entirely sufficient for the expression of our ideals. And now that we have entered upon an era of concrete construction, and that too with a suddenness and determination that is thoroughly and typically American, we cannot reasonably expect designers to throw aside all tradition and make for a new style. This will take time. Nevertheless, they are gradually coming to recognize in concrete a material that will afford abundant opportunity for originality and individuality, and, accordingly, bold excursions have been made into the new fields with creditable results.

In looking about for inspiration, we may turn to a number of sources. There are, for instance, the picturesque Oriental mosques, with their domes and minarets, or the aristocratic old palaces of India so full of suggestions of all kinds.

But above all, we cannot resist the inspiration of the charming Spanish missions of the Pacific Coast countries. Here we find an architecture which, though not of concrete, strongly suggests the same in its simple treatment of wall surfaces and openings. The designers of these charming buildings were fearless in departing from traditions. They frankly recognized the limitations of available materials, and, working as they did, under the greatest possible disadvantages, succeeded because they studied the possibilities and logical adaptations of their material. Fortified as they were with the true principles of art, in which they were thoroughly grounded, they produced practically a new style, which, however, sacrified nothing of quiet dignity and repose, and avoided the pitfalls of the new style of the present day, L'Art Moderne or Art Nouveau. Such is the spirit which should possess and guide the designer of concrete today.

Concrete as it is used in superstructures, being the only kind which we are considering, is based upon the use of a small aggregate, about one inch and less in size, and mixed wet so as to make a solid, dense mass. This produces a soft, plastic material which should be mixed by machine to produce the best results. This, on the

other hand, cannot be economically done unless large quantities can be used without serious interruption, and it follows naturally that such a structure is more or less perfectly monolithic in character, and at once this feature becomes the dominant note of the structure. Monolithic is freedom from joints or even semblance of joints. This idea should be expressed in our concrete designs and it should be the dominant characteristic. To accomplish this successfully, we should endeavor to treat wall surfaces in masses as large as possible. They need not necessarily be kept entirely plain, although this would depend upon the nature of the design.

In cottage work and small buildings generally, such large plain surfaces are perfectly delightful, especially when given a rough finish. This can be accomplished in various ways. First of all, the concrete may be left just as it comes from the molds. In this case the aggregate should be quite small, not over one-half inch, and the mix should have the minimum allowance of water, making what is called a dry mix. In doing this, however, there is great danger of the wall not being waterproof, so that, if possible, such a mix should be used directly against the forms and the balance of the wall made of wetter, richer mix and of fair thickness that will prove sufficient to be waterproof; or else this rich concrete may be used throughout and the forms removed before the final set, and the skin of the concrete removed with water and a good stiff wire brush, or with acid. Then again, the concrete may be allowed to get good and hard and the surface tooled off. But with all such treatments there is always the danger, as first indicated, of having a damp wall, especially where it is not very thick, as is apt to be the case with reinforced concrete. Practical considerations, however, must finally govern, lest the unfortunate architect's life be made miserable by the complaining client, who naturally expects and is entitled to a dry wall. Under such conditions it is, therefore, advisable to plaster the concrete wall with a good coat of waterproof mortar and give this a rough finish by the various methods at hand, such as brooming or floating with a rough, carpet-covered float, or stippling, or pebble-dashing, or splatter-dashing, all of which methods are commonly understood.

The fresh mortar thus applied may be modeled by hand, producing some simple ornamental design, naturally in low relief.

Advocates of polychromatic architecture, too, have here splendid opportunities of using tile or faience, which may be applied to the surface with telling effect, provided that it is used sparingly, and entirely as a subordinate, so as to emphasize the character of the concrete and enhance its beauty and effectiveness.

In large, massive work the surface may be broken by raised or sunken work, such as panels or ornaments, cast directly in the concrete by applying reverse molds to he inner surface of the form work. Cornices and band-courses, or other simple architecural features, may be fashioned in a similar manner, although in such work, if small members are used, the concrete should be mixed quite wet, or else a rich mortar should first be deposited against the forms before the concrete is poured in; this would avoid the danger of honeycombing on the finished surface and the necessary patching resulting therefrom. Such mortar should be mixed with some waterproof compounds to prevent blotching or staining.

A recently introduced waterproofing material is a liquid solution of iron, which is applied to exposed concrete surfaces and soon oxidizes, turning to a beautiful spotted nut-brown, the familiar color of old iron rust. Such a treament would be charming, if applied to a picturesque cottage; in fact, it might be used with good effect upon large wall surfaces in more pretentious work. In any event, it could be safely done with perfect propriety from an artistic standpoint.

However, it is not our purpose nor our province here to exhaust the subject of the proper or possible treatment of wall surfaces, nor to attempt to prescribe any definite or final formulae or principles of design. We can only hint at them now, for they must finally be left to the slow but certain process of evolution.

To summarize, then, our subject of the "Artistic Expression of Concrete," presents to us two phases, the practical and the theoretical; the former just passing from its infancy to its childhood period, if such an expression may be permitted, and the latter being as yet in a decidedly nebulous condition. If we are to proceed on the assumption that a distinct individuality of style can ever be imparted to concrete construction—and this seems to be the substance of this discussion—

then in reviewing the practice of this new art we must agree that the designers have proceeded too hastily, with too much lack of consideration, and that they are not doing justice to themselves or to the material in clinging so closely to the architectural forms that have been evolved by centuries of gravity construction.

On the other hand, in considering the theory, we cannot but feel much sympathy for such designers, for they are hard pressed by the extreme revolutionary character of our new material. Concrete, being structurally serviceable only in its reinforced form, implies practically monolithic construction, and its economical use compels the economical design of its members, and the consequent use of high unit stresses, many times in excess of those in brick and stone masonry.

It is primarily an emergency proposition, and while we are not wont to credit engineers with much artistic instinct, we must admit that they are doing much toward guiding designers to the path which will eventually lead them to a true concrete style. This is especially the case in bridge work. Hitherto they have struggled in vain to produce anything artistic in the design of steel bridges; but now they are reveling in our new material, and beautiful designs in concrete bridges are quite common.

In tall buildings, however, the advance has not been so favorable. The first tall concrete building employed concrete for structural purposes only, and no attempt was made to use it directly in the artistic expression. It was veneered, in fact, with marble, brick and terra cotta, and perhaps wisely so, for thereby many pitfalls of a new and untried all-concrete architecture were avoided. In other words, it virtually determinated the function of concrete to structural purposes as is done with steel, and by dominating its adaptability in this respect gave a tremendous impetus to its general adoption. Along with this movement went the common practice of using the external veneer and curtain walls, and architects seem very loth to abandon this method in favor of an all-concrete facade, largely on account of the many practical difficulties and uncertainties involved. Nevertheless, some serious attempts have been made to overcome them.

Possibly this may be pointing the way to a final solution of the perplexing problem of skyscraper design. Who knows? It certainly contains the elements of sound logic and common sense and is far more rational than the veneered skeleton method. But let us see what it means, not only in respect to tall buildings, but rather to concrete architecture, generally speaking.

As we said before, unit stresses are much higher; piers are therefore of necessity small in comparison with masonry walls, and floors are thin; doors and windows no longer require lintels, and roofs become monolithic with the walls. With one sweep, therefore, all our principles of a stable architecture are destroyed, and the consistency upon the familiar divisions of the classic column, which gave us the formula of base, shaft and capital, perfectly balanced upon one another.

In fact, this new art of building fairly compels the abandonment of our beloved friends the classic orders, for they evidently do not fit in very well with the new dispensation. On the other hand, our clever designers are too thoroughly grounded in the classics and too much imbued with their spirit to follow with alacrity the call of the new order, and they refuse to take seriously the dictates and vagaries of the Nouveau Art.

Nevertheless, conditions are growing more favorable for the development of this style, and while there is as yet but little tendency in that direction in this country, some creditable work is being done abroad, and we practical Americans may be able to glean much good from such efforts.

It seems strange that we have been so slow in this country to take up concrete for the construcion of our houses. We certainly have not wanted for precedents. In fact, years ago, before concrete was scarcely thought of, Messrs. Carrere and Hastings, as you all know, constructed numerous buildings in St. Augustine, Fla., in which they used concrete made of the local coquina rock, very white and beautiful. Notable among these was the Ponce de Leon, a beautiful design in Spanish style. Another charming example was the Presbyterian Church at St. Augustine.

It is not altogether unlikely that the boldness of this departure, together with the practical difficulties of construction, and possibly the unusual delicacy of the detail in this work, were the cause of deterring architects from following such a lead. For, after all, simplicity of treatment is the real secret of the successful concrete design, and we may gain hope from the cement and plaster work which is being executed rather extensively in

all parts of the country. In fact, much of this work might just as well have been executed in solid concrete.

The style is generally good and is finding favor with concrete designers, who are eagerly adopting it in much of the new residence and miscellaneous work, to which this is so admirably adapted that it appears to be the natural solution of this phase of our problem, and we easily recognize its influence in the best examples of recent solid concrete work.

Nevertheless, it is highly probable that our concrete architecture will carry with it for some time to come the practice of design in all current styles, or no style at all, and that if we would ever expect it to assume a really artistic expression—one that will have the true ring and will endure for all time, it will be found only in isolated examples, produced now and then by some genius with the divine spark, as is the case with all true works of art.

CONCRETE OF EXPOSED SELECTED AGGREGATES.

By Albert Moyer, Assoc. Am. Soc. C. E., New York City.

To the lay mind a well defined style of architecture means something following in the traditional footsteps of our predecesors. The development of a new style of architecture must necessarily be an evolution, so it is not the writer's intention to discard precedent.

That an original style of American architecture is possible and perfectly rational is obvious and beyond question. These ideas have been carried out in a residence designed by Tracy & Swartwout, Architects, No. 244 Fifth Av., New York, built on Ridgewood Road, South Orange, N. J.

The house is designed to accord with the natural surroundings and the material employed. It is not a copy, and is original. A recognizable and original style of architecture is a rational expression of the principal characteristics of the people for whom the structure was erected modified by the requirements of the structure and the available building material.

If you employ concrete, let it look like concrete, design for concrete, eliminate all thought of stone, brick, wood or plaster. Let the house stand up and be able to say to the casual observer, "I am solid, strong, substantial durable, beautiful, and am of concrete." That which looks right to the practiced and trained eye is right. For country residences particularly, where there are winding roads, trees, a hillside and possibly rocks, concrete treated as concrete looks right.

Convenience and adaptability seem to point to concrete as a material best suited to assist in developing, what I am pleased to call, American architecture.

In using concrete for country residences, I wish the reader to eliminate from his mind all thought of concrete such as he sees about him in retaining walls, bridge abutments, and other work where concrete has been employed, but to try to picture a concrete made of selected materials, the molds or forms taken off as soon as possible while the concrete is yet green, the surface scrubbed with a scrubbing brush, or if the concrete is too stiff a wire brush, water being sprayed on with a hose, thus removing all the mortar which has come to the surface, and exposing the larger pieces of aggregates; in fact throwing them slightly in relief, giving a rough surface of accidentally distributed colored stones.

As the walls are erected in different courses, the lower courses are from necessity stained by surplus water running down from the upper forms. This is very readily removed by washing off the walls after the house is completed with commercial muriatic acid, 4 to 6 parts water, which further brightens up the different particles of stone and removes any cement stain which may be on the outside surface of the stone or the mortar which bonds the stones together.

The aggregates used in the house on Ridgewood Road are composed of 1 part Vulcanite Portland cement, 3 parts lime stone and white marble screenings about the size of sand, 5 parts of ¾-inch trap rock, and 1 part of 1-inch white marble chips. When the boards were taken down, the surface had the appearance of the ordinary dead mouse-colored concrete, but as soon as scrubbed and washed with a hose, all the particles of trap rock and white marble chips, bonded to-

gether by light colored mortar, were exposed, giving a surface which was slightly roughened, and a color effect and tetxure which is beautiful. Photographs do not do justice to the color of this wall. It is bright and full of life. By reference to the accompanying illustrations, it will be seen that the material used is concrete honestly employed and the source of strength is evident. Durability, honesty, simplicity, and strength are the prominent characteristics. It is a true, artistic, picturesque, monolith concrete house.

This treatment of concrete surfaces removes practically all the board marks where one course of concrete is bonded onto another. It eliminates the danger of temperature cracks, hair cracks, etc., showing on the surface, and gives a wall which is 100 years old on the start and which will age beautifully. Vines will add to its beauty and if moss gathers on the north side it will be still more beautiful. The effect is the same as that produced by a century of age.

The foundation walls of the house on Ridgewood Road are 14 inches thick, resting on footings 20 to 22 inches wide, the ground having been previously thoroughly tamped. Chimneys were built entirely of concrete, the flue lining being provided for by 8x12 and 12x12 flue lining which acted as an inside form, thus making the construction of the chimneys very economical. Supporting piers and columns were also built of concrete. ,

Dampproofing to cellar was provided for by an outside drain carried all around the house just below the cellar floor level, the outside walls being painted with two coats of a waterproofing paint, then plastered with mortar, forming a permanent protection to the waterproofing.

The walls above the first floor beams were lined with porous, hollow 2-inch terra cotta furring or partition blocks. This was accomplished very economically at the cost of about 10 cents per square foot complete. These blocks were set inside the forms or molds similar to laying brick, the concrete being tamped in between the outside forms and terra cotta blocks, the blocks having been previously thoroughly soaked with water. It was found that the blocks bonded perfectly to the concrete and could not be torn loose in any place.

To avoid any possibility of dampness, these blocks were waterproofed with two coats of the waterproofing paint, which not only clings with a perfect bond to the porous terra cotta blocks, but the plaster for the inside of the house hangs to it far better than to any lath which has yet been devised. This furnishes a wall which is solid and substantial, warm in winter, cool in summer, dampproof, and eliminates all possibility of condensation from the inside.

This wall was reinforced where necessary, particularly over windows, and four horizontal courses of ¾-inch wire cable were imbedded in the concrete, running all around the building, tying the walls together perfectly, acting as a reinforcement against temperature stresses, and making the house practically earthquake proof.

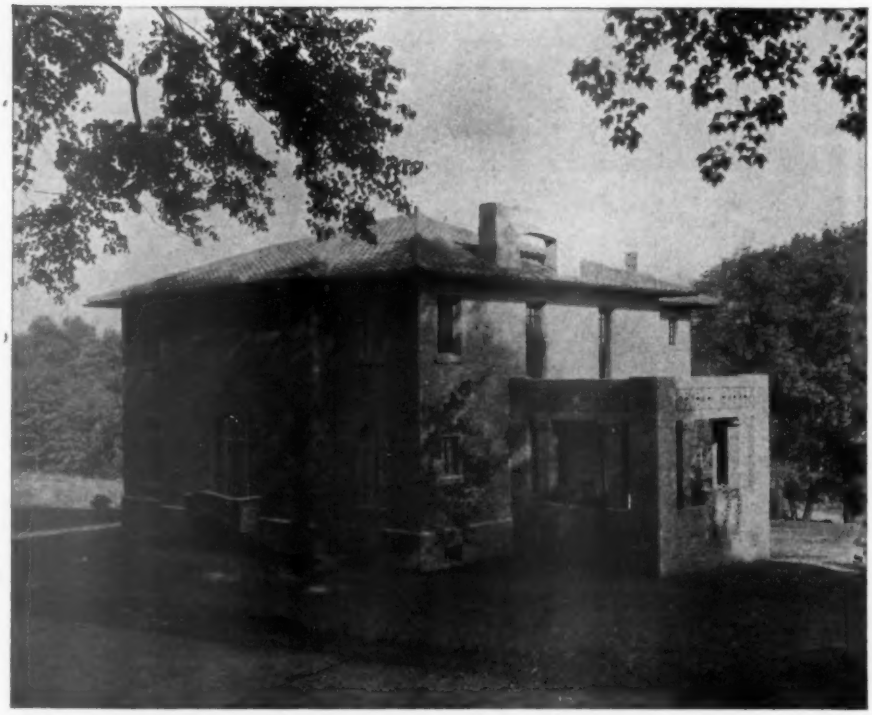
The concrete was very carefully mixed by hand, As each shovelful was turned, it was raked with an ordinary garden rake. This was repeated until an intimate mixture resulted. Mixing was first done dry then wet, sufficient water being added to produce a medium wet concrete, which was thoroughly tamped in the forms in 6-inch layers, each course being carried to the height of about 3 feet at a time, and allowed to set hard before the next course was put on top.

The selected aggregates used composed all of the concrete. They were not put against the outside forms by hand, but were mixed all through the concrete, thus giving an accidental distribution of white and dark particles far more beautiful than if the arrangement of the particles was deliberate.

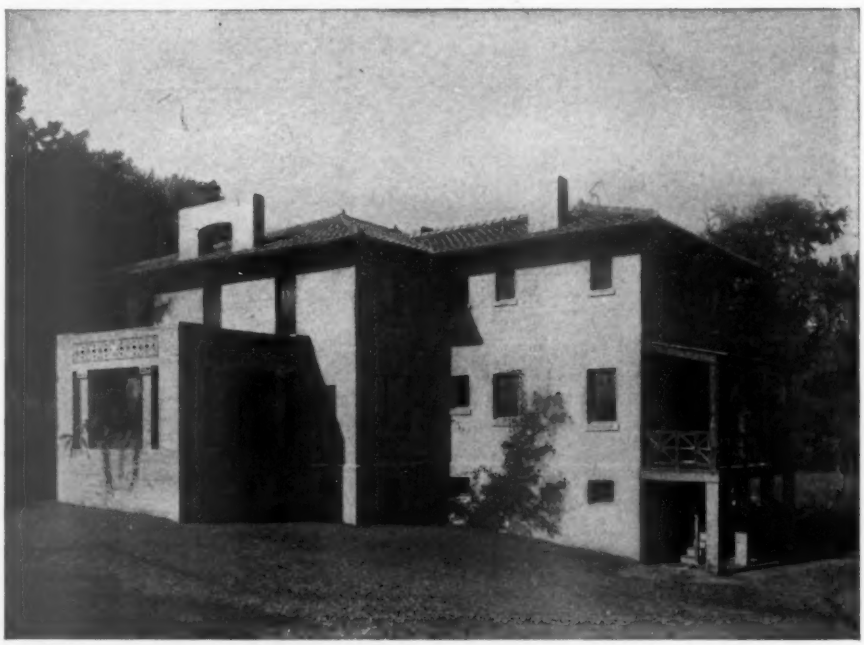
The walls above the watertable are 10 inches in thickness; 8 inches of concrete and 2 inches hollow porous terra cotta furring blocks.

In describing the effect of this surface to the eye, it is almost impossible to present the color effect produced even by means of a photograph. Before viewing the house some architects criticised this method stating that it would give too rough an appearance, others did not think it practicable from an economical standpoint, others expected efflorescence, and all kinds of trouble, but after viewing the house their opinions were changed, and it is now believed by some of the best architects and engineers in New York to be the correct method of treating concrete economically and artistically.

The difference between stucco finish and mortar face concrete and exposed selected larger aggregates, is that the stucco finish even though scrubbed or treated with acid would present to the eye too fine a grain for the large space



MONOLITHIC CONCRETE HOUSE
Residence of Albert Moyer, Orange, N. J.



MONOLITHIC CONCRETE HOUSE
Residence of Albert Moyer, South Orange, N. J.

of wall. This fine grain surface even though of good color becomes monotonous. Some will say that the finished block of granite shows a fine grain surface which is beautiful, forgetting that when set in a wall, the surface of the wall is from convenience and necessity broken by the mortar joints. The surface of exposed selected larger aggregates gives a "Basso Relievo" effect, and their accidental, therefore natural, distribution throughout the concrete, not only avoids monotony, but brings about extreme beauty.

The window openings were provided for as the concrete was placed, by temporary wooden forms so arranged as to form a rebate all around the window frame on the inside of the concrete wall, so that a permanent frame could be set in this space, making the window water tight. The windows being set in the inside of the wall, show shadows and depth of wall, thus forming part of the architectural scheme. The sills were not placed until after the walls had been entirely completed. These were scrubbed on the sides but trowelled on the top.

The south porch with its square pillars and plain caps ornamented with handmade various colored tile is noteworthy. The roof of this porch is a 6-inch slab re-inforced with bars and expanded metal. The top of the slab is painted with two coats of dehydratine on which was placed a mortar coat trowelled and finished, and cut in squares as in sidewalk paving. This has proven to be perfect water proofing, and acts as a floor to the open porch above. The floor of the lower porch is a 6-inch reinforced slab finished on top with a 1-inch red mortar coat marked off in small squares.

The fireplace on this porch, which is one of the illustrations, was built up with the walls. It was afterwards decorated with the tile mosaic of the "Indian Making Fire," which was designed by Mr. Henry C. Mercer. This pattern, which is 20 inches in diameter, consists of pieces of clay burned in many colors superficially or throughout the body and unglazed. The tesserae are not rectangular as in Roman or Byzantine mosaics, but are cut in multiform shapes to suit the potter's process, and their contours themselves help to delineate the design.

As the lead in stained glass holds together the glass units, so does the Portland cement in these tile mosaics. The fireplace is furthermore a good illustration of a concrete design. No one could think of this design in marble, brick, granite, wood or other material.

The same may be said of the balcony under the large front window. This is also decorated with handmade tile of various colors. The balcony was first carved out of clay as a model, the molds being made of wood in accordance with the scale of the clay model.

The fireplaces inside the house are solid concrete, which, however, does not show, as usual wood mantels of plain design are used; the breasts around the opening being covered with handmade Moravian tile in colors and various designs. The hearths are of concrete in which are laid handmade Moravian tile, glazed and unglazed. The mortar joints were not pointed; in fact were purposely roughened.

There is no woodwork outside of this house which touches the ground, or comes anywhere near the ground. The roof is of dull red Japanese pan tile, the tile being taken from the run of the kiln, so that there were colors all the way from dark purple to salmon, the general eeffct being a dull red.

The beams supporting the roof were tied to the walls by means of bolts set upright in the concrete. The same method was employed in tying the floor beams and girders to the walls, so that no "battering ram" action could take place in case of earthquake. The floor beams were not set in the concrete, but rested on and were spiked to 4x4s fastened to the concrete by means of bolts set every 15 inches, these bolts being firmly anchored. When the inside forms were taken off, these bolts protruded 5 inches. The 4x4s to be used were then placed up alongside these bolts, and marked where the came. Holes were then bored through the 4x4s, which were slipped over the bolts, each bolt fitting in its proper place and being screwed very tight by means of nut and washer. This method on first glance was open to criticism on account of shfinkage of the wood, but on further thought the shrinkage would not be as much as the pressure of the nut against the wood, they having been screwed very tight.

The concrete back of these 4x4s was dampproofed with the waterproofing paint. This method of providing for the floor beams was very economical and convenient, serving the purpose admirably.

Decoration and color of the outside walls were provided for by primitive handmade colored clay tile both glazed

BALCONY AND FRONT WINDOW
Residence of Albert Moyer, South Orange, N. J.

and unglazed. All tile mosaics were designed by Mr. Henry C. Mercer, and furnished by the Moravian Potteries at Doylestown, Pa. These tiles were set in design and placed inside the forms before the concrete was dumped in.

The size of the panels and their distribution were from drawings furnished by the architects. When the forms for the concrete walls were taken down, these board negatives were left in the concrete until the wall had been scrubbed. They were afterward removed, thus leaving a 1-inch recess conforming to design, in which the handmade tiles were placed, they being set in mortar, sometimes light colored mortar, sometimes darkened.

As Mr. Henry C. Mercer aptly expresses it, "I paint my patterns with clay paint, but I draw my outlines with your cement."

Each panel of handmade tile produced most artistic results and forms a very handsome combination with the color and texture of the concrete surface. The color effect produced is glorious and yet unobtrusive, being of earth color and pastel shades of a very primitive nature.

With no straining for oddity, simply to be original, this house can well be said to be unique in this country. It is simple, dignified, the countenance is full of expression and alive with purpose, and it harmonizes with the natural surroundings and gives a feeling of strength and repose.

MUNICIPAL IMPROVEMENTS IN MEXICO.

By W. D. Hornaday, Austin, Tex.

In addition to the many millions of dollars that the Mexican government has already spent in improving the harbors and port facilities at Salina Cruz and Coatzacoalcos, the Pacific and Atlantic termini, respectively, of the National Tehuantepec railway, Congress is now called upon to make an appropriation of $5,190,250 for more important work that has been planned for the two ports. The same bill which carries this proposed appropriation also contains an item of $3,000,000 which Congress is asked to provide for completing the system of water works for Mexico City.

The federal government is carrying out a broad policy of water supply and sanitary improvements in all parts of this country. More than $45,000,000 has been donated by the federal government in aid of sanitation and water supply systems which are now in progress of construction in the principal cities of Mexico, according to a report recently made on the subject by Dr. Eduardo Liceaga, president of the superior board of health. Besides the government appropriations for these public works the different municipalities and states in which they are situated have appropriated sums of money equally as large for the purposes named. In some cities, notably Monterey, the water works and sewer systems are being constructed by private parties with an outlay of many more millions of dollars.

The new era of sanitation for Mexico was started less than ten years ago. Most of the public improvements of this character have been accomplished during the last five years. Sewer and water works systems were practically unknown in Mexico only a few years ago. As a result of the lack of sanitation health conditions were bad. The pace for sanitary improvements was set by Mexico City where $28,517,900 have been expended in these works from appropriations made by the federal government for the purpose. Besides this large sum several more millions have been expended by the municipality in constructing sewer systems, canals and general cleaning of the city. On top of the federal appropriation already expended is the $3,000,000 still to be used, which Congress is now asked to appropriate. The $28,517,000 was divided into the following classes: Used in the construction of the drainage works for the valley of Mexico, $15,967,778; for the construction of municipal sanitation system, $8,210,138; for the construction of municipal water works system, $4,339,983.

The sewer and water works systems of Salina Cruz have cost the federal government $1,104,313 up to this time,

FIREPLACE ON SOUTH PORCH
Residence of Albert Moyer, South Orange, N. J.

leaving a balance of about $267,395, yet to be expended and whatever sums may still be required.

The federal government granted the state of Vera Cruz a subsidy of $676,114 on October 2, 1906, to assist in constructing the sanitation and water supply systems for the port of Coatzacoalcos. It is stated that the amount appropriated for those works by the state government exceeded the federal donation.

The total amount to be expended in constructing the sewer and water works systems of the port of Tampico is $2,999,799 of which sum the federal government appropriated $812,250, the remainder being provided by the municipality of Tampico.

The sewer and water works systems of the city of Vera Cruz are said to have cost more than $6,000,000, of which sum the federal subsidy amounted to $3,964,493. Owing to the importance of making these improvements first-class in order that the yellow fever scourge might be eradicated the federal government had direct supervision of the work.

It is announced that the construction of the sewer and water works systems and harbor improvements at the port of Manzanillo will have cost the federal government when completed more than $9,000,000. The first federal appropriation for these purposes amounted to $7,882,760, all of which, with the exception of about $500,000, has been expended.

A little more than two years ago the federal government granted the municipality of Mazatlan a subsidy of $600,000 to assist in the construction of modern sewer and water works systems for that city. It is stated that the municipal appropriation for these public works was about double that given by the federal government.

It has been the policy of the government to grant aid in the way of large appropriations of money for the construction of these public works in the principal sea-port towns in this city. Sanitation and water works systems are being constructed in many of the interior towns at costs aggregating many millions of dollars without aid from the federal government. This is true of Monterey, Chihuahua, Torreon, Parral, Zacatecas, Aguascalientes, San Luis Potosi and other places. In Guadalajara, the second largest city in Mexico, a vast amount of public works has been constructed during the last few years, all at the expense of the municipality, it is said. Following close behind these underground systems of improvements have come street paving and surface drainage.

The example set by the larger cities of the republic in establishing sanitation works is being followed by many of the smaller towns. When the fact is considered that cities ranging from 50,000 to 100,000 people in population were without sewerage and water works systems less than a year ago, it is considered remarkable that towns of 10,000 and 20,000 population should now be arranging to take the advanced step of establishing these public works. It is pointed out that in the well drained mountain towns the necessity of modern sanitation works is not near as great as it is in the towns of the tropics where disease breeds easily.

TEST OF WOODS FOR STREET PAVING.

The last annual report of Andrew Rinker, the city engineer of Minneapolis, Minn., contains a full description of the beginning of an experiment intended to show the relative value of various kinds of wood for block paving. The experiment is the joint work of the U. S. Forest Service, the city of Minneapolis and two contractors for creosoted wooden block paving, the Republic Creosoting Co., of Indianapolis, and the Kettle River Quarries Co., of Minneapolis.

The street selected for the experiment is a part of Nicollet Avenue between Washington Avenue and First Street and the following abstract from Mr. Rinker's report will show the conditions:

This street was originally paved with granite blocks, laid on sand, which had become somewhat rounded on the corners and settled in places. The street was a fairly good granite block pavement, with the attendant noise and unsanitary condition usually prevailing on such streets. It is the principal thoroughfare between the city on the two sides of the Mississippi river. The street farther up on the west side was paved with asphalt and the connecting street on the east side,

for some blocks, was paved with creosoted blocks, so the particular piece was a break in the continuity of a smooth, up-to-date pavement. The only way to make a good, smooth, continuous street was to remove the granite and replace it with some other material.

The U. S. Government, through the Forest Service, desired to make a test of different woods, as to their availability for creosoted pavement purposes. This street was particularly a good place for such an experiment, and as the Forest Service would furnish a part of the timber and they could get the creosoting companies to treat the woods, it was determined to make the experiment here, as the travel was sufficiently heavy to obtain results in a shorter time than on any other street in the city.

Accordingly, the street was ordered paved with creosoted blocks, by the City Council, and a meeting between representatives of the Forest Service, the Kettle River Quarries Co., the Republic Creosoting Co. and the city was held and an agreement as to division of responsibility for the comparative test was made. The Forest Service was to furnish about fifteen thousand (15,000) feet of the requisite sizes of white birch, western larch, jack pine, red fir and hemlock lumber; the Kettle River Quarries Co. was to manufacture, furnish the oil and treat the first three kinds of wood and the Republic Creosoting Co. do the same with the last two and also the southern pine, Norway pine and tamarack, on the regular contract; the City of Minneapolis was to prepare the foundation, put in concrete, lay the blocks and complete the paving, furnish details as to manner of constructive size and cost; also to take traffic records twice a month, also records as to sprinkling, cleaning, repairing, etc.

The specifications called for a 5-inch concrete foundation of proportions 1 cement, 3 sand and 7 broken limestone, a 1-inch cushion of sand, a 5 by 20-inch granite curb and blocks 4 inches deep, 4 inches wide and 5 to 10 inches in length, the joints being paved with paving pitch of medium hardness. The blocks were laid at an angle of 22 degrees 30 minutes with the curb with expansion joints 1 inch wide next to the curb and no cross expansion joints, a row of header blocks being laid next the expansion joint and also parallel with the curb. The blocks were laid in contact and were slightly driven. The roadway is

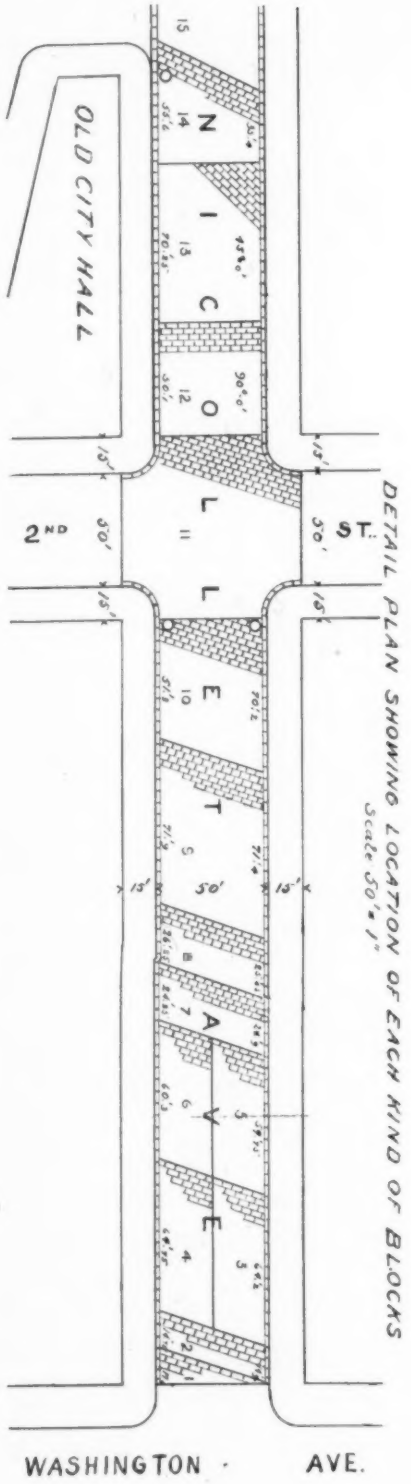


TABLE SHOWING RESULTS OF CENSUSES OF TRAFFIC OVER EXPERIMENTAL WOOD BLOCK PAVEMENT ON NICOLLET AVE., MINNEAPOLIS, MINN.

Classes of Traffic	Wednesday, April 19, 1905. Temperature, Average 64, Maximum 84, Minimum 40. Weather partly cloudy. Condition of Pavement Dry.		Thursday, April 20, 1905. Temperature, Average 60, Maximum 77, Minimum 39. Weather cloudy. Condition of Pavement Dry.		Saturday, April 22, 1905. Temperature, Average 57, Maximum 77, Minimum 37. Weather cloudy. Condition of Pavement Wet.		Tuesday, April 25, 1905. Temperature, Average 56, Maximum 71, Minimum 41. Weather cloudy. Condition of Pavement Wet.		Monday, May 1, 1905. Temperature, Average 62, Maximum 82, Minimum 43. Weather clear. Condition of Pavement Dry.		Tuesday, May 2, 1905. Temperature, Average 61, Maximum 84, Minimum 41. Weather clear. Condition of Pavement Dry.		Thursday, May 4, 1905. Temperature, Average 61, Maximum 82, Minimum 38. Weather partly cloudy. Condition of Pavement Dry.		Friday, May 5, 1905. Temperature, Average 61, Maximum 84, Minimum 38. Weather clear. Condition of Pavement Dry.		Saturday, May 6, 1905. Temperature, Average 61, Maximum 84, Minimum 38. Weather clear. Condition of Pavement Wet.		Monday, May 8, 1905. Temperature, Average 61, Maximum 84, Minimum 38. Weather clear. Condition of Pavement Dry.		Wednesday, May 10, 1905. Temperature, Average 61, Maximum 84, Minimum 38. Weather cloudy. Condition of Pavement Dry.		Totals and Averages.	
	No.	Tons	No.	Tons	No.	Tons	No.	Tons	No.	Tons	No.	Tons	No.	Tons	No.	Tons	No.	Tons	No.	Tons	No.	Tons
1 Horse—Rubber Tire	19	29.5	17	25.5	13	19.5	7	10.5	11	16.5	29	43.5	21	31.5	6	9.0	8	12.0	13	18.5	165	245.5
Steel Tire	206	309.0	240	360.0	402	603.0	287	430.5	485	727.5	570	855.0	276	414.0	353	529.5	368	552.0	543	814.5	3,852	5,778.0
2 Horse—Rubber Tire	450	225.0	25	12.5	19	9.5	14	7.0	10	5.0	81	40.5	63	31.5	26	13.0	13	6.5	9	4.5	660	330.0
Steel Tire	525	2376.0	272	2724.0	562	2664.0	548	2466.0	615	2767.5	637	2956.5	677	3446.5	472	2124.0	569	2277.0	549	2470.5	9,371	37,672.5
4 Horse—Rubber Tire	34	272.0	36	324.0	7	56.0	11	104.0	27	216.0	40	320.0	41	328.0	11	88.0	12	96.0	11	88.0	331	2,648.0
2 Horse—Rubber Tire	284	1704	221	1326	229	1374	149	894	282	1692	310	1860	276	1656	210	1260	153	918	135	810	2,449	14,694
Steel Tire	780	4680	780	4680	1,000	6000	744	4464	1,000	6000	1,000	6000	1,000	6000	1,000	6000	1,000	6000	1,000	6000	8,780	52,680
4 Horse—Rubber Tire	341	2728.0	190	1520.0	196	1568.0	144	1152.0	216	1728.0	237	1896.0	216	1728.0	160	1280.0	160	1280.0	160	1280.0	2,370	18,960.0
Steel Tire	838	6704.0	831	6648.0	817	6536.0	547	4376.0	744	5952.0	744	5952.0	744	5952.0	744	5952.0	744	5952.0	744	5952.0	8,441	67,528.0
Heavy	18	72.0	32	128.0	32	128.0	32	128.0	32	128.0	32	128.0	32	128.0	32	128.0	32	128.0	32	128.0	352	1,408.0
Light	1,253	5012.0	1,004	4016.0	1,004	4016.0	1,004	4016.0	1,004	4016.0	1,004	4016.0	1,004	4016.0	1,004	4016.0	1,004	4016.0	1,004	4016.0	11,053	44,212.0
Loaded	218	327.0	155	232.5	196	294.0	155	232.5	155	232.5	155	232.5	155	232.5	155	232.5	155	232.5	155	232.5	1,705	2,557.5
Horse and Automobile			72	288.0	72	288.0	72	288.0	72	288.0	72	288.0	72	288.0	72	288.0	72	288.0	72	288.0	792	3,168.0
Totals	3658	5973.5	4325	6012.8	4149	6560.0	3407	6235.0	4409	6951.0	4409	7414.0	4111	7249.4	2191	5996.6	2910	5664.0	2715	6258.8	39,954	67,255.6
Average tons per foot of roadway, Estimating 50% of travel on middle 20 ft. of Traffic—average tons per foot	117.47		138.26		130.16		128.91		138.26		149.26		131.33		150.99		116.02		114.77		1,277.17	
	211.45		249.22		234.26		224.64		249.22		268.66		236.40		271.77		208.83		206.60		2,299.04	

50 feet wide and has a crown of 8 inches.

The accompanying diagram shows by the numbers the locations and kinds of blocks. Besides the kinds of wood, there seems to be some attempt to compare blocks of various lengths, various angles of courses of blocks with the curb, fine and coarse grained timber, and amount of oil injected into the blocks. The following statement shows the conditions existing in each of the numbered sections on the diagram all being laid at the above prescribed angle except as noted:

1. Norway pine, 6, 8 and 10-inch blocks, 16 pounds of oil per cubic foot.

2. Tamarac, 6 and 8-inch blocks, 16.2 pounds of oil per cubic foot.

3. White birch, 6 and 8-inch blocks, 22.1 pounds of oil.

4. White birch, 4 and 6-inch blocks, 22.1 pounds of oil.

Classes 3 and 4 are laid each on one-half the width of the street.

5. Western larch, 4-inch blocks, 20.4 pounds of oil.

6. Western larch, 6 and 8-inch blocks, 20.4 pounds of oil.

Classes 5 and 6 are laid each one-half the width of the street.

7. Red fir, 6 and 8-inch blocks of fine grained wood, treated with 15.8 pounds of oil per cubic foot.

8. Red fir, 4, 6, 8 and 10-inch blocks of coarse grained wood, 15.8 pounds of oil.

9. Southern pine, 6 and 8-inch blocks, 18.5 pounds of oil.

10. Hemlock, 4, 6 and 8-inch blocks, 15.5 pounds of oil.

11. Norway pine, 6, 8 and 10-inch blocks, 16 pounds of oil, this section being the intersection of Nicollet Avenue and Second street.

12. Norway pine, 6, 8 and 10-inch blocks, 16 pounds of oil, laid with courses perpendicular to the curb.

13. Norway pine, 6, 8 and 10-inch blocks, 16 pounds of oil, laid with courses at angle of 45 degrees with curb.

14. Tamarac, 6 and 8-inch blocks, 16.2 pounds of oil.

15. Norway pine, 6, 8 and 10-inch blocks, 16 pounds of oil.

It will be noted that the experiments on various angles of courses are made on the Norway pine blocks and that these blocks are also used to close up in sections 1 and 15 and for the special conditions on the street intersection, section 11. The dimensions of the other sections are shown on the diagram.

Washington Avenue is paved with

sheet asphalt. Second Street is paved with granite block. Nicollet Avenue beyond section 15 is paved with creosoted wood block, but Hennepin Avenue, a diagonal street entering at this point, and the triangular space next to the "Old City Hall" in this sketch are paved with granite blocks.

The oils used in creosoting the blocks conformed quite closely to the Minneapolis specifications. That used for creosoting the birch and larch was somewhat heavier, being solid at 22 to 25 degrees centigrade, losing less on distillation at temperatures below 210 and more at temperatures above 210 degrees centigrade than the oils used in treating the other kinds of blocks.

The accompanying table shows the results of the traffic censuses that have been taken.

Tests of paving brick upon a similar plan were attempted in Detroit some years ago and an article giving the results of the rattler tests of the bricks before laying and of an inspection of the street after three years' wear will be found in MUNICIPAL ENGINEERING, vol. xxii, p. 283. This experimental pavement was finally taken up without completing the observations so that the original purpose of the comparison was not carried out. A test of a number of paving materials was begun in Baltimore some years ago, but the pavement was badly injured by the great fire and was laid on insufficient foundation so that the results of the comparison were incomplete and unsatisfactory, as stated by Mr. Fendall, the city engineer, in MUNICIPAL ENGINEERING, vol. xxxiii, p. 412. Another test of brick pavements is said to be in progress in Chicago, but thus far no information regarding it is available. It is to be hoped that the Minneapolis experiment will meet with better fortune and will add materially to our knowledge on the subject of timbers available for wooden block paving.

STREET ENGINEERING.

By Rutger B. Green, M. Detroit Eng. Soc., Detroit, Mich.

This paper, read before the Detroit Engineering Society and printed in the Journal of the Association of Engineering Societies, is given to our readers with the hope that it will excite discussion. The author puts an old proposition in a new way which gives it some attractions and others may have some ideas about details which they are willing to contribute.

Let us take a 320-ft. block on a 66-ft. street in some older portion of the average American city and go back to the time when the owners of the adjacent property laid out the street and platted their land into 40-ft. lots.

The amount of thought given to the design of the street was evidently to allow about 44 ft. for the roadway and 11 ft. on each side for sidewalks and tree space, the sidewalk usually taking the 6 ft. next to the fence.

City water was soon needed, to supply which a 4-in. or 6-in. main was laid through the street somewhere near its center and separate lateral service pipes laid to each house supplied. The same was done when sewerage and gas were needed, so that to supply each of the 40-ft. lots on each side of the street with water, sewer ad gas required three trenches the length of the block and three trenches across the street every 40 ft. Probably before all of these house services were put in, the street was paved; and services put in after that had to cut the pavement to connect with the mains. If telephone conduits were laid through the street, the pavement had to be cut and replaced by a patch. If steam heating conduits were laid, the pavement was cut to pieces again; and now, whenever sewer, water, gas, telephone or steam conduits need any minor repairs or additions, the pavement is cut up and patched—poorly patched as a rule. Pneumatic tubes and high pressure gas mains may come later and possibly a subway, which latter would require every foot of piping in the street to be relaid.

The expense of cutting these pavements and the botch patching that usually marks the attempt to replace a pavement over a new trench, suggests that our street pipe engineering is still of what might be called the stone age, or cobble-stone age, more strictly speaking. It did not cost much to tear up and replace cobble-stones laid on a sand foundation, and the concrete foundation that brick and asphalt call for is hardly thirty years old.

To attempt now to remodel the pres-

ent systems of piping in any downtown paved street might be a greater expense than to put up with the present haphazard arrangement, although a mere pipe gallery in front of a modern office building seems an infinitesimal addition to the cost of the building. It does seem possible, however, to start our new streets with a view to more systematic arrangement for probable future needs, to clean up the rubbish pile by beginning at the outer edge.

Consider, for instance, the water supply of the 320-ft. block having a 66-ft. street. If we have one main somewhere in the middle of the street and run taps to each of the 8 lots on each side, we have 320 ft. of 6-in. cast-iron pipe laid by a contractor in one job with cheap labor, and 528 ft. of lateral service pipe laid by plumbers at different times and different costs,—very different just at present, even when they tunnel a pavement. Suppose, now, that instead of one 6-in. main in the middle of the street we have two 4-in. mains, one at each edge of the street. Then we have the water at the street line for every lot at the expense of only 640 ft. of 4-in. cast-iron pipe laid all at once at contract rates.

The length of trenching where pipes are laid on each side of the street will be equal to the length of trenching with one main down the center of the street and laterals to each lot when the street width is equal to the lot width, which is rather rare with city lots, showing that under ordinary circumstances the two side mains are the cheaper. This considers trenching length alone. The great advantage of having two mains and no lateral, of course, comes in not having to pay plumbers' prices for the laterals and having no pavements to tear up. There seems to be no good reason why the property owner should not have water, sewerage, gas, etc., delivered to him at the lot line instead of having to dig way out into public property for them.

It is true that the space at the side of the street is used more or less for store areas. It is city property, however, and should be governed by the city needs. There should not be any great objection to moving the pipes out into the street to the edge of an area, if necessary, provided the area builders pay the cost, which would be a very small increase to the cost of business blocks. When stores come, trees usually go; if the area needs the pipes' space, let the pipes have the tree space. Trees seem like railroads, by the way; we need them badly, but have evidently got to insist on municipal ownership, or government control including regulation of roots.

Where the system of alleys prevails, piping may often be laid through them, the economy depending upon the depth of the block, the fact that plumbing usually centers a the rear of houses helping somewhat.

As large trunk mains are generally laid once and for all on special grades and require few repairs, it would probably be cheaper to lay the very large ones near the middle of the street in addition to having the house mains on each side of the street. It might tend to economical uniformity in piping if the four sides of a block were considered a unit, to be served by small pipe fed from the trunk mains. There seems to be room for a distribution unit intermediate between our present house connections and street mains. It would seem that if a ⅝-in. water connection or 4-in. soil pipe does for single house, that a 3-in. or 4-in. water pipe and a 6-in. or 8-in. sewer should take care of one or two city blocks, and perhaps a 2-in. for one block if there is sediment in the water. House connections could be made to the intermediate units, which would be laid at the street edge and be connected up to the large supply mains at every block or two, according as the territory is built up.

There should be state laws governing the suburbs of large cities, so that when annexation is probable, piping laid in the suburbs before annexation will conform to city systems after becoming a part of the latter. There should also be city laws putting the control of all street piping, etc., under the city engineer, so that private companies having franchises for under-ground work in city streets can be properly controlled and their piping made to conform to the general good of the city.

Now that the cement sidewalk has become the standard, it would seem best for the city to contract for it, blocks at a time, just as the main paving of a street is now done.

There might also be less trouble in getting sites for garbage disposal plants if householders were required to press and dry kitchen refuse for city collection, thus getting rid of the dripping swill barrel and wagon.

It is the writer's belief that street design is a subject that might well be considered by a special committee of

any or all our engineering societies. American city engineers are too subject to political caprice to have time to work out such problems, but it seems to be only reasonable that such a special committee could recommend a street section or sections, quoting which city engineers all over the country could apply for authority to lay out new street work with reasonable assurance that their work would be right, whether the street remained a residence one, or gradually was taken up by business. Certainly, the present indiscriminate and perpetual tearing up of expensive pavements is no more creditable to the engineering profession than tearing a house to pieces to get at the plumbing was to architects until they studied out their present accessible plumbing methods. Street piping is merely plumbing of larger sizes and could easily be made accessible, if not in the older streets, then certainly in new streets, and the rate at which our cities are growing means that, immense as the number of new streets is now, it will be still greater as each succesive year rolls by.

PAVEMENT GUARANTIES, THEIR USE AND ABUSE.

*By J. W. Howard, C. E., E. M., Consulting Engineer, New York City.**

At the Annual Convention of the American Society of Municipal Improvements during October, 1907, the subject which received most attention and discussion was that of pavement guaranties. The papers and discussion led practically to a unanimous conclusion that municipalities do not protect the interests of the taxpayers by making paving contracts with long-time guaranties; but that cities should depend on the quality of the work constructed under good specifications rigidly enforced by the city engineer and his experts, whether in the permanent or temporary employ of the city for that purpose.

From the point of view of municipalities and property owners, the principal objections to long-time guaranties are as follows:

First. Municipal officials are naturally careless in awarding contracts when accompanied by bonded time guaranties. They depend on the bond rather than on the reliability and experience of the contractor in the special class of work to be done. They often investigate the quality of the bond instead of the quality of the paving materials offered. They fail to have complete specifications and fail to depend principally upon efficient supervision by the city engineer of the materials and work during construction. It is often stated by officials of Boards of Public Works, paving committees, etc., in awarding contracts to persons or companies whose lack of experience is known and the quality of their materials unknown or whose price is suspected of being too low for good work, that "a good surety bond for so and so many years is offered and we can safely rely on that." There are hundreds of poor pavements in our cities built under "good bonds;" but a "good bond" in a city file is not a good pavement on a city street. The time guaranty bond is a very unsatisfactory, slow and uncertain way to convert a poor pavement into a good one. It takes a pavement from the control of the engineering department and puts it for a long period as a burden on the legal department of a city.

Second. Long-time guaranties have very seldom proved efficient for getting poor pavements made good. There are but a few instances of recovery by a city of damages under a guaranty bond. Because law is a slow process, the pavements meanwhile become more dilapidated. I speak from an experience of some years during which I have examined poor pavements and my reports and testimony have helped cities collect damages from defaulting contractors or from bondsmen. A paper read by the Chief Engineer of Pavements of Chicago and printed in the November number of MUNICIPAL ENGINEERING, shows how slow and unsatisfactory the legal proceedings are, in the cases pending in Chicago for more than three years, to compel contractors or bondsmen to put their pavements in order. New York City must have some expensive and prolonged litigation to secure the guaran-

*A paper for the Board of Trade, Newark, N. J.

teed repairs on at least twenty-seven streets. It is easier and much cheaper for them to prolong litigation than to repair pavements.

Third. The price for a well-constructed pavement, when time guaranty bonds are required, is much increased by reason of the cost of surety company bond premiums, the cost of reserves to cover unforeseen liabilities and contingencies, probable lawsuits, political obstruction, which are factors which cannot be ignored by the contractor, and which are included in the price he charges for the pavement. A city and property holder receives practically no return for these added charges for time guaranties. They often invalidate the assessment and relieve the property holder from paying large amounts, to the injury of the city treasury and often to the contractor himself.

Fourth. Incompetent, inexperienced, scheming or politically affiliated contractors sometimes bid low prices to construct pavements without including sufficient to cover the cost of proper repairs and other liabilities of the guaranty. They sometimes deliberately figure on the basis that if the pavement should fail they will be able, in some way, by friendship, political influence or legal process, to avoid the liability of the guaranty. They too often succeed. Under the unfortunate laws of some States, cities are required to accept such low, "cheap" bids, although offered in competition with the bids of experienced and conservative contractors, who must bid higher to furnish durable and, in the end, cheaper pavements for the city. In States requiring its cities to award contracts to lowest bidder, it is easy to abolish time guaranties and to provide complete specifications, thorough inspection of construction, and thus quickly eliminate the cheap-poor-work-bidder. It is not good policy nor do cities wish to pay for anything less than cost to the contractors.

Fifth. Time guaranties remove from the municipal engineer or officials in direct charge of the work the right to fully direct important details of construction in accordance with their best judgment, either during its first construction or during the period of guaranty. If the engineer exercises his prerogative in directing how any of the details are to be done, the contractor and the bondsmen are thereby often found to be relieved from the guaranty. A recent decision of the New Orleans District Court, in Shea v. New Orleans, a suit to recover money for work alleged by the city to be defective, relieved the contractor from his guaranty, because the work was done in accordance with directions of the engineer.

Sixth. A city should not lose control of its streets at all times by having the pavements on the surfaces under partial control of private contractors, as they practically are during guaranty periods. No one can foretell the needed uses of the streets. No changes, etc., can be made for the benefit of the city or otherwise without, in a measure, the city or property holder losing the asset of repairs of pavements not yet performed during the balance of a guaranty subsequent to the changes, etc., in connection with the street which are needed and accomplished. A city cannot properly control the car-track pavements when they or even the adjacent pavements on a street are under guaranties.

Seventh. It is often illegal to require long-time guaranties in contracts for construction to be paid for by assessment, because the laws require that the general repair to pavements due to general use of pavements shall be paid from the general funds of the city and forbid such repairs to be assessed as a part of the original charge or otherwise against abutting property. If maintenance guaranty is included in the original contract price, it generally thereby illegally assesses the cost of maintenance on the abutting property.

Eighth. A city whose pavements are well constructed and free from time guaranties can make subsequent repairs due to wear or other causes, either by using its own employees or by taking advantage of new competition which constantly arises. It can avoid being tied up with possible monopolies or being kept from repairing its streets for long periods, by having annual repair contracts and paying for the repairs each time they are made. A city thus avoids the heavy bonding and extra indefinite expenses of time guaranties.

Finally many municipal engineers and honest experienced city officers are of the opinion that it is not for the interests of cities to require guaranties beyond such period as will bring out defects due to neglect or accident and that such defects appear within one or two years. It seems now the universal opinion that a contractor shall not be permitted to guarantee a pavement beyond a term of five years because not economical nor best for a city. The tendency now is to

treat pavement contracts the same as contracts for sewers, water pipes and other public works which are not guaranteed but are built right at the start. The municipality through its engineers decides upon the best form of construction, formulates full, good specifications, places the responsibility on its engineers, where it belongs, and secures good results. Large cities can permanently employ competent paving engineers to prepare specifications, test materials and inspect construction, and smaller cities can easily obtain temporary expert assistance as suggested in the following extract from MUNICIPAL ENGINEERING:

There will be no dearth of laboratories and experts to make specifications, examinations and inspections if the guaranty clauses are eliminated, although, probably, few except the largest cities will give employment to experts exclusively their own; the smaller cities finding it necessary to depend upon the services and the laboratories of the experts; and the cities of intermediate size perhaps having their own laboratories, inspectors and chemists working under the orders of experts from without. Better pavements ought to result from this method of controlling their construction. This may be considered the first full formulation of the method, although it has been developing for some years.

In conclusion, we can feel sure that engineering and legal experience shows that a pavement guaranteed for longer than five years is neither economically nor legally safe or best for city or taxpayer. Two years are sufficient to demonstrate the quality of a pavement laid under inspection of competent men. The best plan for city, taxpayer and all concerned is a guaranty or an abeyance of final acceptance for two years from the first of June first following the completion of the pavement. I name June because my experience and observation in Berlin and other European cities, and in many of our cities where I have introduced a similar requirement, demonstrates that a guaranty should terminate, not in wet or cold winter weather, but in early summer, so that any defects will be fully visible, the pavement easily inspected and the repairs properly made by the contractor.

BACK FILLING TRENCHES.

*By George C. Warren, Boston, Mass.**

It is pleasing to note that recent issues of engineering periodicals have devoted prominent space to this matter, which is both one of the most important and one of the most neglected matters which municipal officials and contractors have in connection with street work.

One of the articles referred to quotes from specifications of the West Park Commissioners of Chicago, which are incorporated in permits granted for making excavations in streets to reach underground service pipes. From the quotation, the following extract is of special interest.

All material excavated from any trench under paved roadways must be removed from the boulevard, said trench being refilled with clean cinders, sand, gravel or crushed stone, placed in layers not exceeding six inches in depth, thoroughly compacted with heavy hand rammers, using the necessary amount of water to complete perfect consolidation of the back filling.

This specification is on the safe side, but for general use, it seems unnecessarily severe and expensive in the requirement that all material excavated from any trench must be removed from the street and replaced by cinders, sand, gravel, crushed stone, etc.

I refer to the removal of excavated material from the street regardless of location of work or character of material "excavated from any trench." In the case of West Chicago Park Boulevards, such a general stipulation may be justified by either:—

(a) The importance of not littering the Boulevards any more than absolutely necessary, or

(b) The knowledge, if it is a fact, that the sub-soil underlying this section of Chicago is such that after once disturbed it is unsuitable for back filling of trenches. Whatever may be the reason and justification for such a claim by the Chicago West Park Commission (probably justified there) this is not a general provision suitable for all cities and all classes of subsoil. I do not want to be understood as advocating withdrawal of the greatest precaution and care in the important matter of backfilling of trenches, carelessness in which is cost-

*A paper before the American Society of Municipal Improvements.

ing hundreds of thousands of dollars annually, in damage to pavements and vehicles. My purpose is to point out the importance of the matter and to suggest practicable, general requirements for overcoming the difficulty in the most economical way in each particular case.

With a quarter of a century experience in street paving throughout the United States and Canada, I believe I have met the matter of back filling of trenches in about all of its possible phases, and I appreciate that it is most difficult to draft a specification which will give:

(a) Efficient results.

(b) A basis of payment which will insure the greatest economy to the City and fairness to the contractor.

The greatest difficulty is that the method of treatment and its cost vary widely with the character of sub-soil, which often varies greatly within the limits of a single sewer or water or gas pipe trench. This cannot often be foreseen, and it often varies with the weather conditions (wet or dry) which happen to prevail.

Before attempting to offer a solution I will mention a few instances known to me. There is a popular notion that trenches should be allowed to settle for a year before paving and that then it is safe. This is not only a fallacy which breeds carelessness in cases where it is thought no pavement will be laid in a year or more, but it is impracticable to defer paving a year or more after all mains and house connections are made and equally impracticable to avoid cutting into pavement for installation of and repairs to service pipes. We all know that by careless or indifferent back filling of trenches unpaved streets are often rendered dangerous and nearly impassable for years. I remember about fifteen years ago an instance in one of our older cities where an asphalt pavement was being laid replacing an old cobble pavement. The cobbles and a few inches of the underlying earth necessary to provide the sub-grade were removed; the subgrade rolled with steam roller and concrete foundation laid. While the concrete was setting there was a good deal of rain. At one point in the street the concrete settled and developed a hole into which a hoe handle was inserted the full length without finding the bottom of the hole. Investigation and subsequent examination developed a serious hollow several feet down about two feet below the surface and over two hundred feet long, over a sewer which had been laid twenty-five years before and doubtless back-filled in the general customary way of merely throwing the earth loosely back into the trench. In this case a crust or arch of solid earth had become formed which did not develop the hollow below until the excavation for the new pavement removed a part of this crust and the rains caused the balance of the crust, in one spot, to fall into the hole.

In another instance no trouble developed in the construction of an asphalt pavement laid on concrete foundation, but three years later a horse's hoof broke through the surface of the pavement and he broke his leg. Examination revealed a hole six feet deep, which it took fifty loads of earth to fill, over a sewer trench ten years old. It is very common for a pavement to settle a year or more after laying it over a sewer trench, filled several years before the pavement, where no trouble developed during the rolling and laying of the pavement. It is still more common to find almost insurmountable difficulty, while the paving is in progress, from settlement of old trenches. So much for the theory that however carelessly a trench or other fill is made it will settle itself within a year. On the other hand, I have never known of a case where trouble has followed from the settlement of sewer or service pipe trenches made immediately before the laying of the pavement where I had supervision of the backfilling, even with treacherous soil conditions.

I would far rather guarantee a pavement laid immediately after a sewer trench, the filling of which I could control, than five years after the laying of a sewer, the trench of which was filled with the generally customary carelessness and usual view only to least possible cost.

About two years ago I was going over a street about two miles long in the Middle West, for the paving of which bids were about to be received. A sewer, the trench of which was from 15 to 20 feet deep in a clay soil, was being built, using an excavating machine which back filled without tamping. On account of the looseness of the fill the level of the roadway over the trench was being raised about 18 inches, sloping to near the edge of the road. An inspector was standing over the work and I asked him to show me the specifications. They clearly provided for "thorough tamping of the

trench in courses, not more than 6 inches." On calling the inspector's attention to the provision he first claimed that it only referred to paved streets. I showed clearly that this was not the case and explained that my interest in the matter was as a bidder and possible contractor for the pavement to follow, and received the following retort: "You don't shuppose Misther Murphy (naming the contractor) is going to fill the sewer for youse." The outlet of the same sewer passed through a paved street which I found was actually being filled without any tamping whatever with tip carts loaded from the excavation by buckets and hoisting engine. An appeal to the Engineer brought a promise to investigate. A continuation of the trouble and further inquiry brought out the explanation that this provision of the specification was not generally complied with; that contractors did not figure on doing so; and that it would be a hardship to force him to the expense, and that as the pavement would not be laid for a year, the trench would probably be settled by that time. This is only a somewhat aggragavated case of what happens in fully three-fourths of the sewer trenches which are built.

Now, for the remedy, which is more difficult than to call attention to the common faults.

In the case of permits to service corporations, plumbers and property owners, to cut into the streets, whether paved or unpaved (the former is but little more important than the latter), it is only necessary to stipulate in the permit that "the trenches shall be back filled by such means as the City Engineer may direct, depending on the character of the excavated material, in such a manner that all excavated material shall be replaced in the trench without raising the grade of the roadway. Flushing will only be permitted in cases where the subsoil is sand or gravel or other material from which the surplus water will readily drain away, and in the case of concrete or brick sewers or pipe sewers, the joints of which have been made water-tight with bituminous pipe-jointing cement."

A prominent contractor who had a large experience in sewer construction and one who takes the greatest care in the execution of his work, has recently written me as follows:

In pipe sewers, no puddling of ditches should ever be allowed, for it is impossible to prevent the water getting through the joints of the sewer pipe, and it is very likely to cause settlement in your pipe, thus breaking your cement joints. Some 20 odd years ago, in Somerville, Mass., I took the most extreme pains in having joints cemented, leaving a stretch of ditch for some few hundred feet open until the cement had thoroughly set. I personally examined every joint to see that it was a good job. We then filled the ditch, and after it was about half filled, the water was turned into the ditch from a hydrant. In a short time the 8 inch sewer pipe at the manhole at the lower end was running half full.

In criticism of this proposed requirement references may be made to the volume of the pipe. My reply is that except in trunk sewers (which do not apply to permits referred to), the volume of the pipe is so little in comparison to the volume of the trench as to be insignificant. It is well known that more earth can be tamped into

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a trench than is removed from it. In my judgment the only case where the rule of "get back all the dirt" cannot apply is in rock excavation, in which case the breaking up of the rock nearly doubles its volume and the particles of rock are so large that they cannot be replaced to their original density.

In the case of contract work for sewers, etc., the case is more difficult in view of the necessary uncertainty of conditions to be met under ground, and consequent uncertainty of the most ecomomical way to properly "back fill" the trench and consequent impracticability of the contractor accurately figuring in advance what the cost "per lin. ft." will be. On this account some contractors are sure to bid far too low to permit proper work. Others figure "safe" with the probability that if they receive

the contract, the total price will be too much above the estimated cost. In one case the city has the almost impossible task of forcing the contractor to do proper work at a loss. In the other case the city will pay too much for the work. An effort should be made to avoid both evils.

My suggestion is to apportion the prices in such a way that whatever material is encountered a fair price will be allowed the contractor for each as follows:

(a) Furnishing and setting pipes per lin. ft.

(b) Earth excavation per lin. ft. (providing for varying prices for varying depths of sewer.)

(c) Rock excavation per lin. ft. (providing for varying prices for varying depths of earth.)

(d) Hauling excavated material to spoil bank (if unsuitable for back filling and its removal directed by the Engineer) per cu. yd.

(e) Lumber delivered on work (if any is required for shoring) per M. B. M.

(f) Placing and replacing (if lumber reused) in sewer trench per M. B. M.

(g) Refilling trench if back filled by flushing earth excavated from trench per cu. yd.

(h) Refilling trench if back filled by tamping earth excavated from trench per cu. yd.

(i) Refilling trench if back filled by flushing suitable borrowed material (to replace unsuitable excavated material drawn to spoil bank by order of Engineer) including furnishing the material per cu. yd. measured in the wagons as material is delivered.

(j) Refilling trench if back filled by tamping suitable borrowed material (conditions the same as item "I") per cu. yd.

(k) Refilling trench with rock excavated from the trench per. cu. yd.

Corresponding with such a schedule of prices in proposal and contract, the specifications should provide as follows:

1st. Material excavated from the trench, which in the opinion of the Engineer is unsuitable for back filling, shall be hauled by the contractor to a spoil bank and shall be paid for at the price bid per cu. yd. for "hauling excavation to spoil bank," measurements to be made in the wagons at point where loaded.

2nd. Flushing in back filling will be permitted only in case the material is sand or gravel or other material, from which in the opinion of the Engineer the surplus water will readily drain away and leave the earth filled solid.

3rd. Except where flushing is directed by the Engineer, the back filling shall be done by thorough, hard tamping in layers not exceeding six (6) inches in depth. Flushing will not be permitted except in cases of brick or concrete sewers or pipe sewers, the joints of which have been made water-tight with bituminous pipe jointing cement.

4th. Whether back filling of earth is done by flushing or tamping the full amount of material excavated from the trench less the volume of the sewer shall be refilled into the trench without raising the grade.

5th. In case rock is excavated from the trench, it shall be back filled by carefully placing the excavated rock in layers with succeeding layers of earth well flushed into the voids between the pieces of placed rock.

6th. In case the excavated material is clay, which in the opinion of the Engineer is too wet to enable solid back filling by tamping, the excavated wet clay and reasonably dry "borrowed" earth shall be tamped into the trench in succeeding layers, using enough of the dry earth to overcome the excess of water in the clay and to provide a solidly filled trench to the satisfaction of the Engineer. The "borrowed" earth including tamping to be paid for per cu. yd. of "borrowed material" tamped into the trench. Measurement of the borrowed material is to be made in the wagons as delivered on the work.

If anyone thinks these requirements are complicated the answer is that the conditions are necessarily complicated. None can tell in advance the conditions of materials to be excavated and the treatment they should receive in back filling. The simple and incomplete specifications and the method of payment generally adopted in the past, have resulted in general unsatisfactory results. Requirements should be provided which will correct the evil of poorly filled trenches, however complicated they at first appear.

Of course it must be expected that the cost of efficient and proper back filling of trenches will be much greater than the cost of the inefficient system generally in vogue. The increased cost will be nothing compared with the saving in repairs to road surfaces and vehicles.

A prominent engineering paper which makes a specialty of earth work

published a series of tables of interesting and complete cost data collected and tabulated with very great care. One report of twenty-six jobs on sewer sections in one city aggregating 8882 lin. ft. shows an average cost of back filling the trenches of .0722 per cu. yd. The soil is generally reported as good clay and that back filling was done by hand shovels. It is well known that this is a very low average cost of bare shovelling of earth under the most favorable conditions, so that the back filling must have consisted of loose shovelling of the earth into the trench. What about the condition of the roadway, whether paved or unpaved, following this shoddy work and what about the vehicles which have to pass over nearly two miles of this street during the next few years?

Referring to the provision above for paying for the excavation of sewers per lin. ft. with varying prices for varying depths of sewer. It will be appreciated that at depths exceeding 8 ft. the cost of excavation in sewer trenches per cu. yd. increases very rapidly. With increased depth of sewer it requires quite complicated calculations to estimate the number of cubic yards of material excavated. The suggestion, therefore, is made for paying for excavation per lin. ft. of sewer of each size and of each depth. If, therefore, the sewer has varying depths and varying sizes of pipe, not only should separate prices per lin. ft. be taken for each size of pipe, but also for each increase over 8 ft. per ft. of depth of sewer. This method of payment for the excavation or trenching not only overcomes the necessity on the part of the Enginer, and consequent general delay in payment for the work, of complicated calculations of the amount of earth excavated but it also removes all possible dispute between the contractor and the engineer in case the plans are changed, either increasing or decreasing the depth of sewer, which changes are often made necessary. If, as is the general custom, payment for excavation or trenching is made either per lin. ft. or per cu. yd., without reference to the depth, the contractor can justly complain and will be sure to do so on the ground that not only is the amount of work being increased but the cost per cu. yd. of earth removed is being increased by reason of the increased depth. With this condition and no provision in the contract for variation of prices to meet the condition, there is pretty sure to be a dispute between the contractor and the engineer as to the proper method of payment for the additional work. An important feature in all contract work is to, as far as possible, provide a unit of price in the contract for every contingency which may arise.

An important point, not referred to above in connection with repaving over sewers trenches on paved streets, is the matter of foundation. Even with the greatest care in back filling a trench, it should be reinforced at the top by a solid Portland cement concrete foundation for the pavement. The concrete should extend over the edges of the trench about six inches on each side.

One engineering journal recently suggested that tamping the earth in back filling trenches be done with pneumatic or steam rammer. This offers food for the inventor. For the present tamping must be done by the hand. The common bad practice, where there is even a pretense of tamping, is four to six shovellers to one tamper, with the weakest man in the trench because his work doesn't count in the amount of trench back filled. A good rule is to put two men with heavy rammers in the trench for each shoveller outside. Put the best man at tamping and satisfactory results will follow.

BOOKS FOR ENGINEERS.

The list of books for Engineers begun in the April number of MUNICIPAL ENGINEERING is continued. Suggestions of additions, corrections and changes are invited from our readers for insertion in a supplementary list.

STEAM AND GAS ENOINEERING—Continued.

C. Kerr, E. W. Power and Power Transmission. $2.00. Deals with power transmission and generation by the common means other than electrical.

D. Klein, J. F. Designs of a High Speed Steam Engine. Notes, Diagrams, Formulas and Tables. Illustrated. Net, $5.00.

C. D. Linehan, Wilfrid, J. A Text Book of Mechanical Engineering. Illustrated. Net, $4.50.

C. Low, F. R. The Steam Engine

Indicator Illustrated, $1.50. Directions for the selection, care and use of the instrument and the analysis and computation of the diagram. Compiled from the regular issues of "Power."

D. Lucke, C. E. Gas Engine Design. Net, $3.00.

C. D. Mathot, R. E. Gas Engines and Producer Gas Plants. Illustrated. Net, $2.50.

C. D. Meyer, H. C. Steam Power Plants. Their Design and Construction. 16 plates and 65 illustrations. Net, $2.00.

C. D.. Neilson, R. The Steam Turbine. Net, $3.00.

C. D. Parsons, H. de B. Steam-Boilers, Their Theory and Design. Net, $4.00.

C. D. Paulding, Charles P. Practical Laws and Data on the Condensation of Steam in Covered and Bare Pipes. To which is added a translation of Peclet's "Theory and Experiments on the Transmission of Heat Through Insulating Materials." Net, $2.00.

C. D. Peabody, Cecil H. Thermodynamics of the Steam Engine and Other Heat Engines. $5.00.

C. D. Peabody, Cecil H. and Miller, Edward F. Steam Boilers, $4.00.

C. D. Perry, John. The Steam Engine and Gas and Oil Engines. Net, $3.25. A book for the use of students who have time to make experiments and calculations.

C. D. Pochet, M. Leon. Steam Injectors: Their Theory and Use.. $0.50.

D. Poole, H. The Calorific Power of Fuels. $3.00. With a collection of auxuliary tables and tables showing the heat of combustion of fuels, solid, liquid and gaseous. To which is appended the report of the Committee on Boiler Tests of the American Society of Mechanical Engineers. (December, 1899).

C. Power Catechism. The. $2.00. Correct answers to direct questions covering the main principles of steam engineering and the transmission of power. Compiled from the regular monthly issues of "Power." Intended for special assistance in preparation for examinations or where direct information is desired.

C. D.. Ripper, William. Steam Engine Theory and Practice. With 466 illustrations. Net, $2.50.

C. D. Roberts, E. W. The Gas Engine Handbook. Net, $1.50. A manual of useful information for the designer and the engineer..

C. D. Robinson, W. Gas and Petroleum Engines. Illustrated 2 vols. $8.50. A manual for students and engineers.

C. D. Rowan, F. J. The Practical Physics of the Modern Steam Boiler. 324 illustrations. Net, $7.50.

D. Seaton, A. E. A Manual of Marine Engineering. Illustrated. Net, $6.00. Comprising the design, construction and working of marine machinery.

C. D. Sennett, R. and Oram, H. J. The Marine Steam Engine. Net, $6.00.

C. D. Snow, Walter E. Steam Boiler Practice. $3.00. In its relation to fuels and their combustion and the economic results obtained with various methods and devices.

C. D. Spangler, H. W. Greene, Arthur M., and Marshall, S. M. Elements of Steam Engineering. Illustrated. $3.00.

D. Stevenson, F. W. Modern Appliances in Gas Manufacture. Net, $1.50.

D. Stodola, Dr. A. Steam Turbines. With an Appendix on Gas Turbines and the Future of Heat Engines. Illustrated. Net, $4.50. The best book on the subject in any language.

B. C. D. Thurston, Robert H. A Manual of the Steam Engine. 2 parts. Each $6.00; together $10.00. Part I. Structure and theory.

A. C. Watson, E. P. How to Run Engines and Boilers. $1.00. With a new section on water boilers. Practical instruction for young engineers and steam users. Elementary and practical.

D. Witham, Jay M. Steam Engine Design. 210 illustrations. $5.00. For the use of mechanical engineers, students and draughtsmen.

D. Kent, Wm. Combustion and Smokeless Furnaces. $1.50.

D. Dowson, J. Emerson. Producer Gas. 73 illustrations. 295 pp. Net, $3.00.

C. Christie, Wm. W. Boiler Waters. 235 pp., 77 illustrations. Net, $3.00. Theory elementary and superficial, practical part good.

C. D. Carpenter, R. C. Experimental Engineering. 843 pp., 335 illustrations. $6.00.

D. Jude, Alexander. The Theory of the Steam Turbine. 296 pp., 252 illustrations, 3 folding plates. Net, $5.00. Treats mainly of practical design.

D. Sankey, Capt. H. Riall. The Energy Chart, practical applications to reciprocating steam engines. 170 pp., 157 illustrations, 1 folding plate.

C. D. Moss, Sanford A. Elements of Gas Engine Design. 197 pp., 50 cents.

C. D. Stevens, T., and Hobart, H. M. Steam Turbine Engineering. 814 pp.. 516 figures. $6.50.

EDITORIAL COMMENT

Who Pays for Water.

Franchise Taxation and Rates for Service.

WHO PAYS FOR WATER.

On another page will be found a table prepared by W. J. Flynn, the assessor and collector of water rates in St. Louis, Mo., showing the number of customers of the plant for each item in the flat rate schedule and the amounts received for each. This table will repay study and may lead other water departments to prepare similar tables. The flat rate schedules have been prepared almost wholly from comparisons with those in other cities, rates being pushed up wherever possible, especially those rates where a comparatively small increase would make a considerable increase in the total receipts. When reductions in rates are made they are likely to be where large reductions really affect but few people and so would not greatly reduce the total receipts. This makes on its face and to those unfamiliar with the facts an apparently large reduction but actually a very small one.

For example, an increase in the charge for tenement rooms in St. Louis of 10 cents making the total charge 60 cents for 6 months, would increase the total receipts $21,719.50, quite a respectable addition to the income with little real effect upon customers, one having a 40 room tenement having an increase of only $4 for 6 months or $8 a year. It would require more than 32 cents increase in the water closet rate to produce the same effect, and nearly 90 cents for a 4 or 5 room house.

The tables will give an opportunity to study the rates for different services to determine whether each is producing its equitable share of the total, and should be great aids in devising practical and reasonable rates.

The tables made for systems under municipal ownership should aid other cities in making contracts for water supply. At present the city officials are quite in the dark regarding the proceeds from the various items in the rate schedule and so they are unable to make intelligent demands for reductions in rates. The officers of the water company can supply themselves with this information and so by counter offers of apparently larger reductions can often save themselves material losses.

No two cities are exactly alike regarding the proportionate numbers of customers under the various rates, even if they happen to have the same rate schedules, so that the data from one city will not be applicable in detail to another, but they will serve to put the city more nearly on an equality with the company in the discussion of the question of rates when a new contract is to be made.

Nearly 40 per cent. or $367,823, of the income from the St. Louis works comes from meter accounts, of which there are about 6,000; making the average receipts per meter $61 for 6 months or $122 a year. Meters are doubtless set on the connections of the larger consumers, so that the amount of water used per metered tap is much greater than the average amount per unmetered tap.

The next largest item of receipts is $108,597 for tenement rooms at 50 cents each, and the next $100,974 for water closets at $1.50 each. Both these classes of service are open to great waste. A 4 or 5 room house has the same charge for one tap as the water closet and the receipts in 6 months are $36,952. The 10,141 six-room houses brought $20,282, the 16,860 one to three-room houses brought $16,860. Fifty cents is added to the rate for each room above 5 to 10 and for each 2 rooms above 10, up to 20 and the rate for tenements is 50 cents a room without reference to number of rooms. Considering the less probabilities of waste of water, especially in the larger private houses, this slight discrimination in their favor seems to be warranted.

Private baths at $1 each brought $52,598. There are 64,101 private houses, , besides the tenements, and 12,000 stores, shops and offices among which to distribute the 52,598 private baths and the 67,316 private water closets, showing very general use of these modern conveniences which have rapidly become real necesssities.

Other large items are sprinkling

$34,901 and buildings $22,197, large enough to show the effect of even slight changes in rates. The more the water works manager examines this St. Louis table the more interesting he will find it and the more desirable he will find a similar table for his own system. MUNICIPAL ENGINEERING will be glad to print similar tables from other cities.

FRANCHISE TAXATION AND RATES FOR SERVICE.

One of the interesting subjects under discussion at the Jamestown convention of the League of American Municipalities was that of lowering rates for public service and franchise taxation as methods of relieving public service corporations of the surplus which they may be collecting on account of rates for their service being higher than the cost of supplying the service. It is not proposed here to go into the details of the question but to consider briefly one or two of the fundamental principles underlying the proper solution of the problems involved.

It is generally assumed that a reduction of rates or an increase in taxation is the matter for consideration and this is usually a correct assumption, for a company which started with rates too low has either failed or has managed to secure an increase. The development of the city has often increased business so as to make a losing proposition profitable, or a profitable one still more profitable.

The question of rate regulation did not enter into the first contract for most of the older franchises, because the town was small, its future was comparatively uncertain, and it was glad to make any concessions necessary to get the desired service. The town grew, the profits of the service increased, frequently until their magnitude had to be concealed by means of reorganizations, increases of capitalization mainly on account of increase in value of franchise, and only incidentally on account of increase in plant. To whom does this profit belong?

On the one hand we have the company accepting the franchise and taking the risk of failure, which was not small, as the many wrecks of original companies can testify. This company claims the profits because it took the risk and should be paid for it. On the other hand is the town, which has become a city, mainly from its location, the development of the country, the efforts of its citizens, but also because of the existence and probably the quality of the service of the public service corporations. So far as the public service corporation is concerned a considerable portion of its increase in profits is due to the "unearned increment" which came directly from the growth of the city. To whom does this "unearned increment" belong? Whatever may be the sentiment regarding this class of increase in the value of real estate, there is a growing sentiment in favor of the proposition that a large part of this addition to the value of the franchise should accrue to the city. There is no other apparent reason for the strong feeling against increase in capitalization on account of increase in value of franchise.

These considerations give some basis for the usual willingness, when settling the questions arising on renewal of franchise, to allow corporations to retain without objection, all the profit which has accrued. The pertinent question in the renewal of the franchise is what to provide regarding such increments in franchise value in the future. A considerable portion of the increase in value may be on account of excellent business judgment in taking advantage of opportunities and in applying methods of extending the business. This part belongs to the company, along with a share of the general increase in value. It cannot well be separated, however, from the general increase and in too many instances it does not exist, so that the exact provision to be made in the new contract for taking care of it must be worked out for each individual case. It is a "local question" as stated by one of those participating in the discussion at Jamestown.

Then comes the question as to how to distribute the city's share of the profits of the business. Here there is room for considerable difference of opinion. One would reduce rates for service so as to cut down the profits. Another would tax the franchise enough to transfer the city's share of the profits to its treasury. Another would combine the two methods of reducing the surplus.

Mr. Allen Ripley Foote, the author of the principal paper presented belongs in the first class and he presents excellent reasons for not taxing the users of the service, through high rates, for the benefit of those who do not use the service but secure the

general city benefits with less cost because they pay lower taxes.

Judge Leser of Baltimore belongs to the second class for he thinks there are more non-taxpayers who are users of public utilities than there are non-users who are taxpayers, and thus there may be an opportunity through higher rates for the service to make these persons pay their share of the taxes of the city, indirectly, by using their excess payments, by means of the franchise tax, to reduce the amount to be raised by general taxation.

If the "unearned increment" mentioned should belong to the city at large, Judge Leser's position receives further strength. But some of the increment would seem to belong to the users of the service who have really caused the increase in profit by their agreements to take it.

Out of these considerations and some of less importance, together with the local conditions, may be worked out a solution for each particular case.

An analogue of the franchise tax is found in the common practice under municipal ownership of public service industries of furnishing the service free for municipal purposes and in many cases appropriating the profits to purposes of city government foreign to the service making the profit. Instances of this are frequently noted in the reviews of municipal reports appearing from month to month in MUNICIPAL ENGINEERING under the heading "Municipal and Technical Literature." This has usually seemed to put an unjust burden upon the customers of the service department, in so far as it reduces the taxes, for example, of the owner of a large building like a warehouse using little water, at the expense of the owner of the small factory next door who uses large quantities of water, while the former has greater value of fire protection, and perhaps more public service of water in cleaning and sprinkling, etc. The same principles ought to be applicable to this case, however, and the question of rates in a municipally owned plant may be quite as difficult a problem to solve equitably as the terms of a franchise for a public service corporation.

THE QUESTION DEPARTMENT

Information About Gas Rates and Costs.

Please wire what reports on gas rates and costs by Alton D. Adams have appeared in MUNICIPAL ENGINEERING and dates.

G. M., ———, Iowa.

The following among the articles contributed to MUNICIPAL ENGINEERING by Alton D. Adams contain information upon gas rates and cost of making and furnishing gas:

Vol. xvii, p. 185; "Cost of Lighting by Incandescent Street Lamps" with some comparisons with gas street lighting.

Vol. xviii, p. 293; "Municipal Light, Heat and Power."

Vol. xviii, p. 351; "Central Heating Stations."

Vol. xix, p. 382; "Public Gas Supply."

Vol. xx, p. 4; "Coal Gas and Water Gas."

Vol. xx, p. 65; "Heating From Central Stations."

Vol. xxiii, p. 160; "Cost of Light in Municipal and Private Gas and Electric Plants."

Vol. xxv, p. 232; "Costs and Prices of Gas and Electric Lighting by Municipal Plants."

Materials for Cross Walks.

Can you give us information as to what materials, other than wood, are used for foot walks at street intersections on macadam and other streets. If possible indicate the plan followed.

H. C. COFFMAN,
Secretary of The Citizens Club,
Chehalis, Wash.

Paving brick and concrete are both used successfully for crosswalks on macadam, gravel and unimproved streets. A good concrete foundation should be put in which will raise the walk a few inches, (say two to six) above the ordinary surface of the street and the brick or cement walk is laid on this foundation, the founda-

tion and top being made all in one piece in the case of a cement walk. With a hard macadam street the rise in the walk need not be more than two inches and a slight rounding, elevating the middle of the walk about that amount above the sides will probably be all that is necessary to keep the pedestrians out of the mud. If the roadway is of clay or loam and bottomless in wet and thawing weather the rounding must be greater and the foundation and wearing surface should be carried down and out a greater distance to take the shock of wheels more easily and help lift them out of the mud and over the crossing. With a brick wearing surface a timber, stone or concrete curb may be necessary along each edge of the walk to retain the blocks in place.

Detailed specifications for such cross walks will be found in the "Handbook for Cement Users" ($3) and they have been described in the following articles in MUNICIPAL ENGINEERING:

"Gutters and Cross-Walks for Macadam Pavements," vol. xxix, p. 269.

"Cost of Concrete Street Crossings," vol. xxvii, p. 115.

"Cement Curbs and Crossings," vol. xxii, p. 90.

"Brick Gutters, Crossings and Paving," vol. xx, p. 214.

"Concrete Block for Stop-Box," vol. xx, p. 275.

"Concrete Street Crossings and Street Railway," vol. xx, p. 278.

"Square or Beveled Joints for Cross-Walks," vol. x, p. 264.

Other materials are occasionally used for cross walks. Thus in vol. ix, p. 114 will be found an article on granite blocks for cross-walks, and in vol. xxi, p. 100, will be found full specifications for laying cross walks with bituminous concrete, an excellent construction if well laid with good materials.

Septic Tank for Creamery Waste.

I am seeking information on the question of septic tank purification for the waste products and wash water of a creamery. Will a closed septic tank break up the animal fats in the sewage so that it will filter away in a bed of sand after it leaves the tank?

AN OLD SUBSCRIBER,
Bemidji, Minn.

Animal fats in quantity are difficult to treat but they are so valuable that it is usually economical to recover them. The only experiments in this line known to the writer are those described in Naylor's "Trade Waste," an English book, which has a chapter on "Wool Degreasing and Grease Recovery." While these experiments would not be applicable in the case referred to, they will give some indication of the difficulties. The author states that "Even the sewage containing the wool grease is amenable to bacterial treatment, but from every point of view it is desirable that the manufacturers should deal with the grease in their own works." The amount of animal fat in the creamery waste would be only a small percentage of the amount of wool grease in the suds from the wool washing and it is probable that, if the effluent from the creamery is discharged into a city or town sewer system, it would not materially affect a septic tank treatment of such sewage. The fats would be retained behind the first surface baffle board until they had been decomposed or incorporated in the scum on that section of the tank. The main difficulty would probably arise from the acidity of the creamery waste. Most domestic sewage is slightly alkaline, and so far as there have been any experiments they show that the purification in the septic tank is more satisfactory and the amount of solids in suspension and in solution is reduced much more by passage through the septic tank if the sewage is alkaline than if it is acid. If the creamery waste is small in amount in proportion to the sewage from the town, it may not materially affect the bacterial action in the septic tank. If the creamery waste is to be treated by itself some addition of lime or other alkali to neutralize the acidity may be necessary to produce the best results. A very small amount would be required, as what is desired is not the old fashioned chemical precipitation but simply a correction of the acidity. The experiments as to exact quantities to use and as to methods of manipulation are believed to be the right ones to make. The creamery waste is probably not uniform in its acidity and this must be taken into account in working out a program of treatment. If the creamery waste in general is properly purified the fats in it will in all probability give no material trouble.

An article on "The Septic Tank and Acid Iron Sewage" in MUNICIPAL ENGINEERING, vol. xxii, p. 324, gives the facts about a sewage made acid by inorganic substances. The organic acids developed in the creamery waste would act differently so that new experiments must be made on lines similar to those suggested to determine

what should be the exact program to follow.

One suggestion is that a septic tank be constructed to treat the creamery waste, so arranged that if the treatment with alkali is found to be demanded the operations for doing it can be readily inserted in the line of flow of the sewage.

Directory of Municipal Officials.

Do you know of any Directory of City Engineers, or of Engineers and City Officials?

W. B., Minneapolis, Minn.

The fourth edition of the "Directory of American Cement Industries" ($5) includes in its list of engineers and other supervisors of the use of cement quite a full list of city engineers in cities or more than 2,000 population, correct to the date of publication. The "Municipal Manual" ($3) has a list of city officials in cities of more than 3,000 population which is somewhat out of date as to names, since the book is dated 1902, but is practically correct as to titles of officials.

Books On Drawing.

I wish to know about Anthony's "Machine Drawing," Hasluck's "Practical Draftsman's Work" and Meinhardt's "Practical Lettering."

I. H. D., New Haven, Conn.

Reference may be made to the list of "Books for Engineers" which has been running for some months in MUNICIPAL ENGINEERING for some information about these books. The list of books on drawing and designing was published in the June number, vol. xxxii, p. 32. Anthony's "Machine Drawing" ($1.50) gives instruction in the application of the principles of projection drawing to making illustrative drawings of machinery. It has examples of work and instructions to draftsmen. Hasluck's "Practical Draftsmen's Work" ($1) gives detailed instructions concerning the materials and instruments for drafting, including quality and methods of handling and caring for them. It contains illustrations and diagrams to exemplify the text. Meinhardt's 'Practical Lettering" (60 cents) is not known to the writer, but is probably devoted largely to the system of spacing free-hand letters devised by the author, which has recently been decided not to be patentable because it can not be included under any of the headings of patentable articles or processes.

Roller Skating on Cement Sidewalks.

Will you kindly advise me through the magazine, regarding the following, viz.:

Is it customary to permit the use of roller skates upon cement sidewalks? Also, will cement walks of good construction be marred or damaged from the use of skates by children? This city has about five miles of cement walk over which the children have been exercising on skates. Some little abrasion is perceptible at the joints and the city council are considering the advisability of prohibiting the use of the walks by mounted kids. It occurs to the writer that a good grade of cement walk should resist damage from this source. Any information furnished on the subject will be appreciated.

SUBSCRIBER,
Great Falls, Montana.

Roller skating on sidewalks seems to be a temporary craze which soon dies out when the weather changes and becomes too hot or too inclement and does not again break out except in spots, so that no stringent regulations are really necessary. Good walks should stand the wear without any evidence of abrasion except a little at the edges of blocks next the joints in the pavement, and this wear does not extend far from the edge. A good walk, like a good cement driveway or roadway, should stand much more severe treatment than it can receive from roller skates. Bad workmanship especially in the finish, and poor materials will show up to greater or less extent under continued wear, but the craze will probably not last long enough to produce very noticeable results even on poor pavements.

FROM WORKERS IN THE FIELD

Practical Points from Practical People.

Contributions to this Department are invited. Give from your experience for the benefit of others. No matter about the style of the composition, the fact is what is wanted. Use the Question Department for what you want to know; use this Department for what you can tell others.

Methods of Waterproofing Building Materials.

Editor of MUNICIPAL ENGINEERING:

Sir: The subject of waterproofing is one not to be passed lightly. The very fact that the penetration of dampness into the various fabrics causes inestimable damage through deterioration of the qualities of the materials and the damage to interiors of buildings, gives great scope for imposition and the bait held out to the afflicted is readily swallowed.

Just as rust in iron causes apprehension, so does this eating process of moisture command the close attention of architects and engineers. As the methods of construction have changed, as buildings extend high up and present more exposed surfaces, as new materials are being hurried into the field of operation, the tendency has not been to diminish the possibilities of this mischief maker, but rather increases them. In the case of concrete construction, which has increased with such leaps and bounds in the past decade, this is especially noticeable, for we observe the importance not only of protecting proper construction, but the fundamental necessity of eliminating many of the haphazard methods of concrete construction, and of looking to capable concrete engineers.

The subject of effective waterproofing is not a complicated one if we will strip it of all the mystery, secret process and hypnotic jargon with which it is continually juggled. When you begin to set forth the principle of doctoring the body of the material through some chemical method which has for its object the building up and hardening the surface walls about the pores, it is simply to ridicule the long standing law of expansion and contraction as a cause of damage. Silicates have been used in this way under various trade names, and while on some fabrics the tendency is to harden the surface by imparting chemically what the elements have taken away, you have not changed cause and effect, for allowing, if you please, that the pore cells have been materially strengthened, the fabric has not been rendered positively waterproof, and with the least moisture lodging in these pore cells, and with alternate freezing and thawing the result is inevitable. Time has proven this over and over again. It is wrong because the whole principle is wrong. Again, chemical powders are mixed into the raw material in the process of manufacture under the claim that the change wrought in the entire body makes it moisture proof; this particularly in concrete construction. The claim is neither reasonable nor has it been proven. Good concrete can be made we will say by taking 100 lbs. cement, 200 lbs. sand and 200 to 300 lbs. crushed stone. Of itself it is very porous. We find it stated that 4 to 6 lbs. of the powder mixed into this 500 lbs. of concrete, makes it absolutely waterproof. This is only a few months old and to prove good it will take years, so that there will be a few people who will prefer to wait the probation period.

Now, the most bigoted must agree in this broad proposition, i. e., if you can positively and permanently prevent all absorption at the source or face of the entire fabric, you will not need any mysterious chemical or powder claims. Is there any proof of such a method of waterproofing which has stood an unquestioned test for twenty years and is so simple and logical that it doesn't take a chemist to comprehend it? There is, and we will state it briefly.

Pure paraffine wax in a melted condition can be carried into the pores of the fabric through the natural law of heat absorption. This is applicable to every kind of building material. It is invisible and is not affected by any acid or alkali and being set in from the surface to a depth say of one half inch (it can be set in one or two inches) cannot peel off or be knocked

off. The proof of its efficiency is the treatment of the Egyptian Obelisk (Cleopatra's Needle) in Central Park, New York, in October, 1885, twenty-two years ago. The Park Department had a very sick patient, rapidly growing worse. In four and one-half years' exposure in the New York climate, 780 pounds had sloughed off. They appointed a committee of experts comprising General G. L. Gillespie (Corps of Engineers, U. S. A.); Prof. R. Ogden Doremus of the College of the City of New York; Prof. J. S. Newberry, Columbia College; Prof. Albert H. Gallatin of New York University, and Alex. A. Julien of Columbia College. Every possible waterproofing method was tested out and they recommended paraffine under heat absorption. The results are well known.

I have discussed the subject of waterproofing with prominent engineers in this country, England and France, including Government Engineers of the three countries. I have observed this paraffine waterproofing in the three above countries and there is not a single waterproofing proposition where paraffine is properly applied, which cannot be treated by this method just as effectually as has the Obelisk.

The whole claim against the paraffine method is that it costs what it is worth and has to be done under the supervision of a person of some little mental capacity. The unfortunate tendency of waterproofing is to get something for nothing. Says one in effect, "Insure your building with me because my premium is almost nothing, but if you have any damage don't expect me to make good. See how cheap your premium is!" And then these "sample" tricks. Take a little block of neat cement and dip opehalf in gasoline. Then pour a little water on each end. In one it has gone out of sight; in the other, it runs around like quicksilver, can't get in. Don't forget, however, to dip it very ofen, as the gasoline evaporates and you may get caught. Oil lasts longer and is looked upon by many prominent architects as a very good means of keeping moisture out of rear brick walls. When you stop to think that alkali (so general in brick, terra cotta, concrete and lime and cement joints) and oil make soap, which is washed away, you will see the reason for so many paint-peeling walls. Wax in solution is very good but you carry in such a small proportion of the wax and so much depends on the wall being perfectly dry, that it is uncertain and not lasting. With the pure wax you have the pure article. With the heat you dry the surface and create absorption for the wax. It is equally effective on rough work and the finest stone or marble facades, monuments or mausoleums. It is the best and cheapest (because it is the best) waterproofing on earth. Try it.

NEAL FARNHAM, C. E.,
42 E. 23d St., New York City.

Mr. Farnham is rather too sweeping in his condemnation of other waterproofing methods than melted paraffine, but after all he puts in striking form the difficulties met with in the use of some of them. Waterproofing methods and materials may be divided into two classes, those which are applied during the process of construction and those which are applied after the structure is completed. There are good and bad methods and materials in each class, and paraffine is doubtless the most successful in the second class in the cases to which it is applicable. Others not quite so good must be used sometimes. There has been and is now so much of the charlatanism of which Mr. Farnham speaks in connection with the subject of waterproofing that his impatience with it is not surprising, but he should not allow it to obscure his vision to such an extent as to hide the really good and the comparatively good methods which can be used where paraffine is excluded for one reason or another. We shall be glad to have further contributions for this Department on the subject of waterproofing from those who have had experience with the various methods and materials, if full information is given so that there can be no suspicion of jugglery of old methods or exploiting of either good or bad materials under cover of secrecy concerning the formula or process.

Device for Making Bituminous Macadam Mixtures.

Editor MUNICIPAL ENGINEERING:

Sir: During the past season the writer has been asked to devise means by which mixtures of broken stone, sand, etc., may be made in a proportional manner for the purpose of manufacturing bituminous macadam pavements, and without resort being had to expensive and complicated machinery; it was also desired that the means should be such as could be attached to and operated in connection with the ordinary asphalt paving plant. In reply to this request we have designed

the arrangement of simple mechanisms which forms the subject of this article and as the matter is one of general interest to the paving trade we beg leave to submit the same through the medium of your journal.

The object to be accomplished is to provide means whereby fixed quantities of broken stone of various assorted sizes may be combined with fixed quantities of sand or other fine material, in such manner that, when mixed together with melted pitch and compressed, a paving material will result that shall contain the necessary amount of pitch and yet no excess beyond what may be required for the mere filling of voids. In the device as I have here shown it by means of the accompanying illustrations, provision is made for the mixing of but four different kinds or grades of material, but it will be readily understood that the idea may be amplified to any extent.

In the illustrations herewith Fig. 1, represents a plan of the mechanism, as though one were looking down on top of it. Fig. 2 shows an end elevation, seen as though the observer might be looking towards the end of the dryer or sand drum. In Fig. 1 the bucket elevator which feeds the dryer is shown as terminating at its lower or ground end in a kind of receiving hopper having sloping sides which converge towards the center where operates the lower or boot wheel of the elevator; this receiving hopper is set into the ground so that its top edge is practically at the grade.

Surrounding the receiving hopper are any number of feed hoppers, as A, B, C, and D, in the illustration, only four being shown for the purposes of this description. These feed hoppers are made with sloping sides which converge to the bottom, and there is arranged in each a feed worm or screw of the helicoid type. At the outboard end of each one of these screws is attached a sprocket wheel, a different sized sprocket being used for each screw.

Conveniently arranged in proximity to the feed hoppers are supply piles of broken stone and sand, the materials which are to enter into the paving mixture. Each pile of stone is of a different degree of fineness, as required. One of the supply piles is of sand.

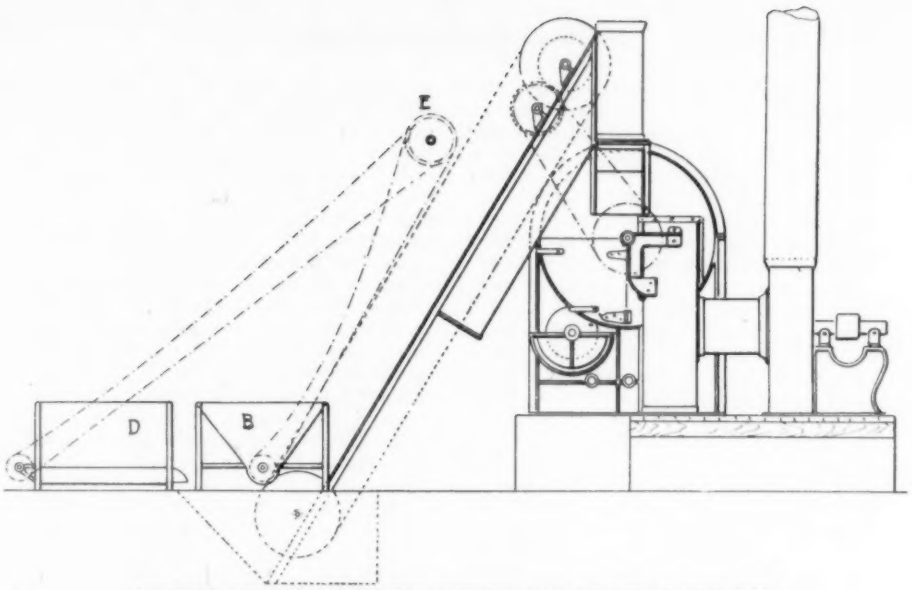
Mechanically suspended above the feed hoppers is the line shaft E. This may be attached to the side framing of the asphalt plant or may be hung to posts provided for that purpose. The shaft E, may receive its power from any suitable connection with the shafting of the plant proper but such connection must be made by means of a clutch so that shaft E may be stopped instantly when desired. The driving connections between the shaft E and the screws or worms of the feed hoppers A, B, C and D, are such that each screw will have its own special speed of revolution, which latter has been previously determined in the following manner, to-wit:

Let it be supposed, for the sake of illustration, that it is desired to make a mixture containing 400 lbs. of broken stone of ¾-in. trap, 200 lbs. of stone of ½-in. trap, 125 lbs. of screenings and 75 lbs. of sharp sand. These proportions having been determined upon, the manufacturer who constructs this mechanism will charge a testing hopper, which he keeps for that purpose, with broken stone of the ¾-in. trap size; then, by means of a variable speed device designed especially for the purpose, he will regulate the speed of revolutions of the feed worm until it will discharge from the hopper exactly 400 lbs. of its contents in a given time, say one minute. When the speed is right for this quantity it is carefully noted and a sprocket wheel is designed for the end of that feed worm which will be of such dimensions that the discharge of 400 lbs. per minute, or at least its proper ratio in relation to the other speeds, will be maintained.

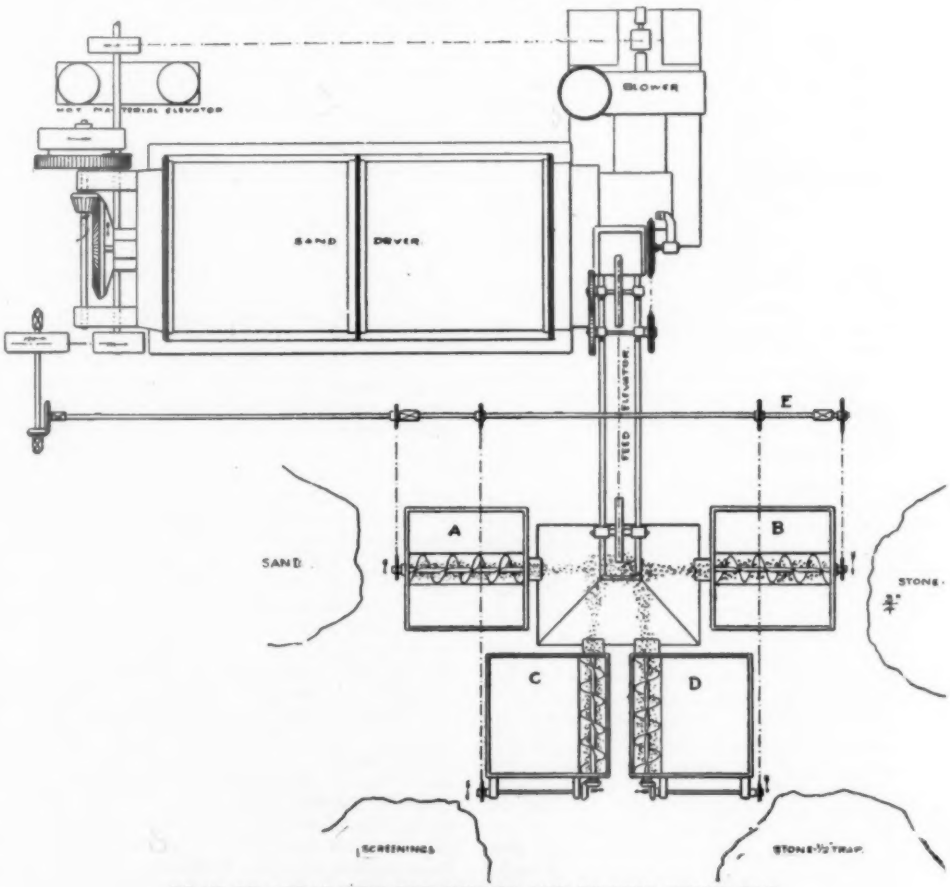
The speeds for all of the other worms are determined in the same manner, with the result that when all are acting together the quantities of each material delivered from the feed hoppers will be exactly in the desired proportions.

It is not claimed that there is anything new in this method of making proportional mixtures of such materials; it may be seen in common use in several types of standard concrete mixers. All that is novel or new in the present case is its application in connection with a paving plant.

Assuming that an asphalt paving plant has been provided with the device herein described its use will be at once plain to those familiar with the art of making asphalt or bituminous macadam pavements, but for those who may not be so conversant with the subject a few additional explanations may not be amiss. Hand labor is used to charge the feed hoppers from the storage piles of material, one man being easily able to



SECTION OF APPARATUS FOR MIXING AND DRYING STONE FOR BITUMINOUS PAVEMENT.



PLAN OF APPARATUS FOR MIXING AND DRYING STONE FOR BITUMINOUS PAVEMENTS.

care for two or three hoppers and keep them filled with material. As the various feed hoppers discharge their contents into the receiving hopper they are caught up by the metallic buckets of the elevator and discharged into the revolving drum of the dryer. It is necessary that a type of dryer be used in which the material may be kept together in its proper proportions as it passes through the drum, as it has been found that when an ordinary plain cylinder drum is used, of the style that operates with one end set higher than the other in order that the material will feed through by gravity, the larger particles of the mixture are apt to run ahead of the smaller and thus cause unequal separation.

After the heated material has passed through the dryer it is carried overhead by means of the usual chain and bucket elevator, but instead of being allowed to deposit and settle in a storage bin it is discharged immediately into a turnover measuring box from which it is deposited in the mixer in the usual manner. The arrangement of mechanism and parts is such that provision is made against any stoppages of work such as might be caused by delays in the arrival of teams, or other causes.

When a device of this character is used the contractor may purchase his broken stone, previously dried and screened into the exact sizes he requires, and is thus not compelled to perform the work of separating the run of the crusher into graded sizes at his own plant, and there will be no waste of material.

FRED A. HETHERINGTON,
Indianapolis, Ind.

Wide Tires and Macadam Roads.

Editor of MUNICIPAL ENGINEERING:

Sir: In your October number you say, page 259: "Constant care is necessary to keep the macadam road from wearing out." Only too true! It is, but why? Narrow tires make it necessary, but narrow tires are not necessary, nor are they good in any way.

This is the fact that appeals to me; constant expense is necessary in wearing out macadam with narrow tires.

I made some tests last spring on macadam, with 6-inch and 1½-inch tires, under a total load of 4,000 pounds. The Missouri Experiment Station, assuming 100 per cent. as pull required on 6-inch tires, found in 1896-7 for good macadam first and only pull 136 per cent. for 1½-inch tires. I found in 1907 for good macadam first pull 134 per cent. and 56th pull 148 per cent. for 1½-inch tires. The 6-inch tires produced no appreciable effect on the road, but naturally the 41 pounds average excess pull due to the excess destruction of the 1½-inch tires left a very decided mark on the road. So great was this effect that my narrow (1½-inch) tire wagon was not allowed to compete in the desired second day's test. Too bad, that I was not allowed to operate on the road for a single day with test narrow tires, but all other narrow tires allowed to operate indefinitely for 365 days in the year.

Just a little further along you say, or allow to be said: "For streets of this character a hard surface with a solid concrete foundation is absolutely essential." I say again, only too true, but why give any street a bad character by using fool narrow tires?

Why, in my macadam test case, the proof shows that no foundation is needed under 6-inch tires, or say for streets of good character.

In one sense, my tests are the best yet; that is, I made the best tests I could make under the circumstances, whereas nobody, in this country at least, has ever come anywhere near doing as much.

However, putting all limitations aside, the Missouri Experiment Station people have made the most important test so far, and very important it is indeed. They found for 1½-inch tires on earth (load 3,500 pounds) average 3 trials 150 pounds; 1½-inch tires on macadam (load 3,500 pounds), average three trials 124 pounds; 6-inch tires on earth (load 3,500 pounds), average three trials 107 pounds tractive force required. Six of these nine trials are good, narrow tires on narrow tire roads, roads more or less narrow-tire-bad; but if the other three trials had been made just right, wide tires on roads only wide-tire-bad, instead of 107 pounds pull under 6-inch tire over road, we should have, say about 80 pounds pull under 6-inch tire. As it was, one trial gave on clay 71 pounds pull under 6-inch tire. Assuming then that these figures, 150 pounds pull under 1½-inch tire over earth road, 124 pounds pull under 1½-inch tire over macadam and 80 pounds pull under 6-inch tire over earth road are substantially correct for purposes of comparison, let us see what the comparison shows. Macadam substituted for earth under 1½-inch (narrow) tires gave 26 pounds less pull, but 6-inch (wide) tires substituted for 1½-inch tires over earth roads would give 70 pounds less.

Now as to the cost of each substitution, of each pull reduction, of each road improvement, macadam costs some thousands of dollars per mile of road improved, and saves only 26 pounds out of 150 pounds and that on the mileage improved only. Wide tires cost very much less than nothing for a road improvement, as to pull, of 70 pounds out of the 150 pounds, and the improvement is for all roads and every mile thereof. Obviously the reduced hardship on roads and vehicles corresponding to and over and above the 70 pounds reduction of pull (or hardship on horses) would pay for any extra cost of extra tire width many times over.

So that wheel tire improvement is vastly more important than road "improvement." Yet, we have this from the road office: "Width of tire is found to have no effect on the traction on hard roads, but it has a very decided effect on the condition of the road surface and on the cost of maintenance."

Oh that some men would not get up and howl about bad roads, when all the while engaged in spending more money in making those same roads bad than in trying to make them good.

How long will it take to improve our roads if we continue to spend more in destruction by narrow tires than in construction?

J. M. HEISKELL,
Memphis, Tenn.

The article to which Mr. Heiskell refers was upon macadam streets in cities and the more severe conditions both as to the disturbance of foundation and wearing surface and as to traffic make concrete foundation desirable if not absolutely necessary. This does not reduce the force of Mr. Heiskell's argument regarding wide tires for roads, however, and the results of his experiments are presented for their value in the study of the road problems.

WATER

Water Power from Water Supply—Bloomfield Waterworks—Report on Drainage—Water Receipts Classified.

Bloomfield, N. J., Municipal Water Works Successful.

In a report to the Board of Trade, at Bloomfield, N. J., at its quarterly meeting held December 12, Allison Dodd, chairman of the Municipal Affairs Committee of that body, said that the water department is now on a paying basis. He stated that during the first three years of municipal ownership there was a loss of $12,000 partly due, he declared, to the fact that the town paid $80 per million gallons of water, while the price now is $65. During the last six months the profit has been $1593, and in addition it is saving $6000 a year paid to the Orange Water Company for water supplied to hydrants.

Flat Rate Water Receipts Classified.

A statement has been prepared by W. J. Flynn, asessor and collector of water rates at St. Louis, Mo., showing the sources from which revenue from water is collected, and enumerating the different classes of people, residences and business house that pay for water. The water rates office has never before compiled a statement of this kind. He says there are 64,061 residences and flats in St. Louis paying the flat water rate exclusive of those having meters installed. The city derives pay from furnishing water in 217,195 tenement rooms aside from hotels and clubs. Citizens of th city are paying for water consumed by 10,940 horse and mules and 3,923 cows, while only 73 companies are paying for the washbottle privilege. This is exclusive always, however, of the meter system.

Mr. Flynn states that about 6,000 meters are installed in different parts of the city. Of 2300 saloons, 1578 are on a flat rate and the remainder have meters. The total amount of revenue collected from all sources by the water rates department in six months, as shown by the statement, is $941,365.90.

A tabulated statement for six months was given by Mr. Flynn showing the amount charged for service for a half year and the total amount collected for that period, as follows:

THOSE WHO PAY FOR WATER.

Statement showing classification of sources of revenue from water consumption, rates established and total amount realized from each source for the months of April, May, June, July, August and September, 1907:

Residences	Number Using Water.	Rate Six Months.	Total.
1 to 3 rooms	16,860	$1.00	$16,860.00
4 to 5 rooms	24,635	1.50	36,952.50
6 rooms	10,141	2.00	20,282.00
7 rooms	3,783	2.50	9,457.50
8 rooms	3,679	3.00	11,037.00
9 rooms	2,346	3.50	8,211.00
10 rooms	1,172	4.00	4,688.00
11 to 12 rooms	1,015	4.50	4,567.50
13 to 14 rooms	313	5.00	1,565.00
15 to 16 rooms	97	5.50	533.50
17 to 18 rooms	25	6.00	150.00
19 to 20 rooms	35	6.50	227.50
Tenement rooms	217,195	.50	108,597.50
Private baths	52,598	1.00	52,598.00
Public baths	172	7.50	1,290.00
Water closets	67,316	1.50	100,974.00
Public water closets	206	5.00	1,030.00
Public urinal basins	709	10.00	7,090.00
Horse and mules	10,940	1.50	16,410.00
Cows	3,923	.50	1,961.50
Vehicles	5,919	1.00	5,919.00
Stable hose	672	2.50	1,680.00
Livery hose	23	25.00	575.00
Dairy hose	122	10.00	1,220.00
Stores	3,084	5.00	15,420.00
Shops	6,943	2.50	17,357.50
Offices	2,130	2.50	5,325.00
Tobacco and cigar factories	79	5.00	395.00
Bakeries	261	5.00	1,305.00
Ovens	368	5.00	1,840.00
Barber shops—			
With 1 chair	14	2.50	35.00
With 2 chairs	270	3.50	945.00
With 3 chairs	204	4.50	918.00
With 4 chairs	42	5.50	231.00
With 5 chairs	12	6.50	78.00
With 6 chairs	9	7.50	67.50
With 7 chairs	1	....	8.50
Beer pumps	308	10.00	3,080.00
Billiard tables	453	1.50	679.50
Churches	218	5.00	1,090.00
Club rooms	62	10.00	620.00
Foundries and forges	302	1.50	453.00
Candy and ice cream saloons	57	7.50	427.50
Restaurants	268	10.00	2,680.00
Saloons	1,578	10.00	15,780.00
Schools (scholars)	14,728	.02½	368.20
Dyeing and cleaning shops	17	12.50	212.50
Halls	193	2.50	482.50
Laboratories	33	12.50	412.50
Laundries	153	10.00	1,530.00
Lunch rooms	212	7.50	1,590.00
Photo galleries	11	10.00	110.00
Tenpin alleys	136	1.50	204.00
Warehouses	398	2.50	995.00
Washing bottles	73	12.50	925.00
Hot houses	149	2.50	372.50
Soda water factories	24	25.00	600.00
Minnow tanks	9	7.50	67.50
Stalls in stables	955	1.00	955.00
Beds in lodging houses	2,392	.25	598.00
Boilers	434	....	5,771.50
Hands employed in shops	9,572	1.00	9,572.00
Gas engines, 285 h. p.	.....	1.50	427.50
Permits and taps	.....	....	7,963.95
Sprinkling	.....	....	34,901.00
Buildings	.....	....	22,197.50
Meters	.....	....	367,823.80
Miscellaneous	.....	....	673.95
Total, six months			$941,365.90

Can Orange Develop Power from Its Water Supply?

Contending that the supreme court has not taken a proper view of the situation, the common council of Orange, N. J., has decided to take an appeal from its decision in the municipal lighting case, in which it held that the city has no authority to develop power from its water plant to use for the operation of a lighting plant. It is said that one of the judges did not concur with his associates, believing that the city was well within the meaning of the act in deciding to build its own plant. The city has already erected a building with space for a lighting plant, with boiler capacity to operate the plant, and had awarded the contract for part of the equipment of the lighting plant to the Crocker-Wheeler Electric Company.

Government Report on Drainage Ordered.

The Senate adopted a resolution, December 9, directing the Secretary of Agriculture to submit a report on drainage, to include the locations and areas of land in the United States that are swampy and overflowed and susceptible of being drained and made fit for agriculture, the effect of such drainage on the public health and upon agriculture, the area of land that has been drained under the laws of the different states, together with the benefits that have resulted, a summary of legislation of different states on drainage, and a review of drainage laws and policies of the leading agricultural counties of Europe. The resolution was offered by Senator Latimer.

Results of Discrimination in Sewer Assessments.

A decision has been handed down in the sewer suit of Thomas S. Simmons against the city of Millville, N. J. After the assessment of benefits for constructing a sewer by the board of sewer commissioners, Thomas S. Simmons, the heaviest property owner in Millville, brought action against the city charging that discrimination was shown by the commissioners in favor of the corporations. The supreme court decided in favor of Mr. Simmons and ordered that the benefits be reassessed. The court of errors and appeals concurred in this decision, but stated that the only reassessment to be made was in regard to the property of Mr. Simmons, and not the entire city.

ROADS AND STREETS

Postoffice and Good Roads—Street Repair Contract—Street Railway Construction—Street Railway Ownership—Manhattan President's Removal—Brick Paving in 1907.

The Postoffice Department for Good Roads.

Good roads receives considerable attention in the report of P. V. DeGraw, fourth assistant Postmaster General, in charge of the division of rural delivery supplies and dead letters. He says, in part:

While material improvement in the condition of roads on which rural delivery is established has resulted through co-operation by the department with the bureau of public roads, Department of Agriculture and state highway offices, and through direct communication with local road supervisors and commissioners, very much yet remains to be done toward bringing these highways to such a state of improvement as to insure the most satisfactory and efficient rural delivery.

The difficulty which the department has experienced in securing the improvement of highways on which rural delivery is established lies in the apathy of patrons, in the absence of highway laws and of highway commissions in some of the states and in lack of concerted action and intelligent and proper methods in other states where highway laws exist.

No great or general improvement in the highways can be expected until the people take an active interest in the matter and secure the enactment and enforcement of adequate highway laws.

It is not difficult in those communities that desire it, to secure an improved condition of roads, through demonstrations and instructions in road building and the use of the road drag, which can be readily obtained from state highway commissions, and in those states having no highway commissions demonstrations and instructions in road building may be obtained upon application to the Department of Agriculture, bureau of public roads.

There seems to be a mistaken idea that the rural delivery service requires ideal roads, and that they must be macadamized or gravelled. This is not the case, but it is required that they shall be kept reasonably smooth, free from washouts and ruts, and properly drained and graded so that they may be travelled by carriers with celerity and safety. While it is desirable, with a view to their permanency, that roads be macadamized or gravelled, it has been practically demonstrated that earth roads can be greatly improved by the systematic and intelligent use of the road drag, and by rolling and proper drainage.

The maintenance of good roads not only insures an earlier and more expeditious delivery to the patrons residing on that portion of the route last to be served, and from whom the most complaints come, but lessens the liability of irregular or suspended service on any part of the route.

As a result of the establishment of rural delivery and the necessity for the maintenance of good roads to insure its continuance, great activity has been displayed in various sections of the country looking to the improvement of road conditions.

An act was passed by the Legislature of Tennessee relocating and classifying the roads in Giles county, declaring those roads on which rural routes were established to be public highways and requiring all gates to be removed from roads travelled by rural carriers.

In Cass county, Ind., mass meetings have recently been held in the interest of good roads, particularly those covered by rural delivery routes. In St. Louis county, Mo., the commissioner of roads and bridges is actively engaged in the improvement of roads and bridges and has asked and received the co-operation of the department in his efforts. Many other communities are evidencing their appreciation of the service by the improvement of the highways.

In the northern tier of states, where the winters are severe and much snow falls, great hardship is imposed on carriers and their animals, due to failure to promptly break out the roads when blockaded with snow, and irregular and suspended service results. In some of the states the law requires the underbrush to be cut from roads and roads to be promptly broken out when blockaded with snow. It would greatly improve the winter service on routes if a similar law were enacted by all the states where it is needed.

Revocation of Atlantic City Street Repair Contract Valid.

The supreme court of New Jersey has rendered a decision in favor of the city in the case of George Miller vs. Atlantic City. The plaintiff had a contract in 1906 for replacing street surfaces over openings made by the gas and other companies laying pipe. Becoming impatient on account of the delay in performing the work, the street committee, after due warning, revoked the contract without giving written notice to the plaintiff to appear before council. The contract contained a clause providing that council could at any meeting pass a resolution revoking the contract if it was satis-

fied that the work was being unnecessarily delayed. The supreme court holds that this, accompanied with evidence that Miller had been repeatedly warned that he would lose his contract if he did not fulfill it, was sufficient to warrant council's action. The decision makes it impossible for the plaintiff to receive any damages on account of his contract being taken from him.

Municipal Ownership of Street Railways in Mississippi.

The supreme court of Mississippi recently rendered a decision sustaining the right of the municipality of Yazoo City to issue bonds for the purpose of building a street railway system. It is expected that this decision will induce several other towns in the state to make plans for municipal ownership of this public utility.

The decision of the court is plain and emphatic, the opinion read by Justice Mayes being that municipal ownership of a street railway is not violative either of the federal or state constitution, or of the charter of the municipality of Yazoo City.

Improved Street Railway Construction.

Some of the members of the commissioners of public works of Milwaukee, Wis., V. J. Schoenecker, Jr., Joseph P. Sherer, and L. A. Jansen, visited in Indiana and Illinois recently for the purpose of securing information on street paving. They visited Peoria and Galesburg, Ill., and Indianapolis and Veedersburg, Ind. They were much interested in the new system of street railway track foundation of which there is a working example in Veedersburg, and contemplate taking this matter up with John I. Beggs, president of the Milwaukee Electric Railway & Light Company. They said:

The new foundation is constructed by means of longitudinal beams made of concrete of sufficient depth, width and height to carry the traffic desired. The two beams are entirely separate and independent of each other, so that a defect in one will not affect the other.

In the top of these beams, are constructed rectangular recesses of two kinds, located at suitable distances apart.

The larger of the two series of recesses is for the supports for the rails and fastenings for them. There is an independent access to a layer of sand which is placed on top for a cushion. On top of this sand is placed a block of suitable material, either clay or creosote block, which projects above the upper surface of the concrete, and serves as a support for the rail. When the blocks are constructed and adjusted for height, a thin coat of tar is placed on top of the sand cushion, the blocks are put in place and the bituminous filler is run around the block, thus giving a water tight joint and an elastic binder of block to beam.

The rails are fastened to the concrete beam at the smaller series of recesses. Below the beam are rods or anchors on which the fastening bolts are nooked.

This new system was thoroughly demonstrated to us at Veedersburg, where a stretch of track had been laid out for over a year. The track is just as true as it was when first laid out. The establishment of that system in Milwaukee would be an exceptionally good thing. When the tracks needed repairing, with the new system the whole street would not have to be torn up.

One of the purposes of the trip was to investigate means of preventing danger to horses by slippery pavements, and they said that they found some suggestions in that line being made in Indianapolis. Crushed granite is first to be laid on streets paved with creosote blocks and a steam roller passed over it, thus forcing it into the blocks and preventing most of the danger. They were of the opinion that Indianapolis had more miles of improved streets than any other city of its size in the country. Regarding this they said:

Miles of smoothly paved streets stretch all over the city. The creosote blocks laid semi-diagonally seems to be the favorite material. They have some of the same trouble with the blocks though, that we have experienced, in that they swell during wet weather.

Many of the sidewalks in Indianapolis are next to the curb, thus making the lawns larger and causing a pretty effect. The sidewalks are as good as the streets, and there are more miles of cement sidewalks than there are miles of improved streets.

Removal of Manhattan Borough President by Governor of New York.

Late in 1906 the Citizens Union of New York published a pamphlet of photographs, lists of defects in asphalt pavements, etc., on the streets of the borough of Manhattan, New York, and by letter of November 23d, 1906, the President of the Borough asked Mayor McClellan of New York to cause an investigation to be made of the affairs of the office of the Borough President, because, under the charter, the Borough President is personally responsible for the condition of the streets, public buildings, etc.

During the spring and summer of 1907, New York employed as independent experts Mr. Marvyn Scudder on accounts and James W. Howard

and others on pavements. After due examination by reports and testimony, the Commissioners of Accounts reported on July 16th, 1907, as follows:

That the President of the Borough delegated no powers to the heads of bureaus; he alone appointed subordinates; required chief engineers to report directly to him; personally controlled specifications; authorized excessive payments to contractors; selected contractors; signed orders for repairs and supplies which should have been contracted for; controlled permits for opening streets; personally issued or failed to issue orders to paving companies to make repairs; permitted pavements to become in a bad condition; used defective paving specifications; wrongly ignored recommendations of paving experts Howard and Whinery, etc., employed by him early in his administration to furnish good specifications and help to secure good pavements; made no systematic inspection to prevent deterioration of pavements under time contracts, especially asphalt pavements; had incompetent inspectors; failed to make repairs or compel them to be made in asphalt pavements and did not compel paving companies to comply with their contracts in respect to maintenance; diverted funds from proper channels; did not prevent unbalanced bidding on wood block pavement; did not enforce specifications for old and new pavements; did not find iregularity in pay rolls; inaccurate records; excessive expenditures without contracts; illicit connection between superintendent and contractors; did not use business methods in expending city money; put no supervision over favored contractors; did not investigate corruption of Bureau inspectors; violated building code, endangering lives and property; did not prevent contradictory rulings. The reports of the experts and testimony are in three volumes.

Mayor McClellan not having power to act, referred the findings to Governor Charles E. Hughes who has power to remove city officials.

The City Club of New York also brought the matter formally before the Governor. President Ahearn and certain officials connected with him, also expert accountant M. Scudder, paving expert J. W. Howard, and others who had served in the investigation, all appeared before him. The Governor devoted about one month to the investigation and on December 10th, 1907, ordered the removal of the President of the Borough of Manhattan from office.

The Governor stated plainly that no criminal charges had been made but that the removal was because the Borough President had neglected to repair pavements or compel them to be kept in repair, although under maintenance guarantees, especially the asphalt pavements. He called attention to the waste of public funds; the doing of much work without contract; the misuse of moneys deposited by plumbers for restoring pavements, by using the money for other purposes; the use of improper and inadequate paving specifications after their deficiencies had been called to his attention about two years ago by paving experts Howard and Whinery then employed by him.

The above case illustrates a new strong tendency in the administration of American cities and becomes a precedent for other cities to follow.

Brick Paving in 1907.

Up to the first of December, the contracts for brick paving entered into during 1907 show the following very satisfactory amounts:

Ohio	1,290,000 square yards
Illinois	765,610 square yards
Indiana	606,301 square yards
Michigan	426,991 square yards
Wisconsin	210,188 square yards

This makes a total of 3,299,095 square yards of brick paving contracted for in these five States in eleven months of 1907. It is estimated that the December reports will increase this nearly to 4,000,000 square yards. Many cities were slow in preparing their work for letting contracts and consequently there was a little difficulty in getting prompt deliveries of brick toward the end of the season, but this will not interfere with the letting of contracts for the new year.

It would be far better for municipalities if they would prepare their contracts for letting during the winter season, so that the contracts could be let at the beginning of the construction season. Materials are then easier to obtain and usually cost less, the work can be better done during the warm season and the hurry and consequent poorer construction on account of the desire to finish up late contracts in the fall will be obviated. Municipalities will get better results, contractors will have easier work, the manufacturers of material will be able to anticipate their deliveries and there will be almost no danger of shortage

in supply toward the end of the season, so that there will be evident advantages to all concerned by early action of the municipal authorities regarding their improvements for the coming year.

Shrinkage of Wood When Dried.

Interesting experiments on the shrinkage of wood due to the loss of moisture have recently been completed by the Forest Service at its timber testing station at Yale University. These experiments show that green wood does not shrink at all in drying until the amount of moisture in it has been reduced to about one-third of the dry weight of the wood. From this point on to the absolutely dry condition, the shrinkage in the area of cross-section of the wood is directly proportional to the amount of moisture removed.

The shrinkage of wood in a direction parallel to the grain is very small; so small in comparison with the shrinkage at right angles to the grain, that in computing the total shrinkage in volume, the longitudinal shrinkage may be neglected entirely.

The volumetric shrinkage varies with different woods, being about 26 per cent. of the dry volume for the species of eucalyptus known as blue gum, and only about 7 per cent. for red cedar. For hickory, the shrinkage is about 20 per cent. of the dry volume, and for longleaf pine about 15 per cent.

In the usual air dry condition, from 12 to 15 per cent. of moisture still remains in the wood, so that the shrinkage from the green condition to the air dry condition is only a trifle over half of that from the green to the absolutely dry state.

Regulation of Public Service Corporations.

Congress has been asked to take a hand in the fight developing throughout the country for cheaper utilities, and against the high capitalization of franchise grants that forms the excuse for existing high charges. The issue has been forced by the attempt of local gas companies to inject new water into their securities under cover of a law that, it is claimed, was smuggled through Congress a few years ago. In the District of Columbia an organized protest against it is being made, the district commissioners, the governing body of the city, having appealed to Congress for the suspension or repeal of the law under which the inflation scheme is being promoted, and for legislation giving them power to regulate utility companies and their affairs. A bill for cheaper gas will be pushed, and the fight for three-cent trolley fares and universal transfers will be forced to an issue.

MUNICIPAL AND TECHNICAL LITERATURE

Municipal and State Reports.

Fifth annual report of the State Board of Public Roads of the State of Rhode Island. Robert F. Rodman, Engineer, Lafayette, R. I. Arthur Blanchard, C. E., Asst. Engr., Brown University, Providence, R. I.

The first move toward improvement of Rhode Island highways was made in 1892, when a committee was appointed by the General Assembly to examine the highways. This committee made an excellent report in 1895, showing the defects in the existing system and making recommendations of improvements. Many of these recommendations were adopted and under the supervision of a state road commissioner the half-mile of road which the state was authorized to construct as a sample in each town applying for it and agreeing to pay one-fourth the cost was built in half of the eighteen towns in the state applying for these samples during the next two years. This work was then discontinued, and local work only was done until 1902, when the present state board was established.

This fifth report is mainly filled with photographs of roads before and after improvement. The law of 1902 is given and the standard state specifications for stone roads and forms of contract and of agreement for wider roads are given. Changes in maximum grades and some results of tests

of road material are given. There is a paragraph of description of each road for which contracts have been let, presumably in 1906, though possibly during the five years' existence of the board. The total expenditures for 1906 for office and traveling expenses were practically $5000, the appropriation; for construction, $41,419 and for state highway construction $175,363. It is reported that $431,414 was available for work in 1907. No detail of expenditure whatever is given in the report nor of the character or extent of the roads built, and neither the engineer interested in road building nor the taxpayer interested in the spending of the funds to which he contributes can get any information of value from the volume, which contains only 38 pages aside from the pictures.

Thirty-Third Annual Report of the State Board of Health of Michigan. Frank W. Shumway, Secretary.

This report is for the year ending June 30, 1905, is dated December, 1906, and is issued late in 1907, showing some of the delays in official reports, many of which seem to be unavoidable. Michigan has one of the oldest health organizations in the United States and one of the most efficient in the collection of statistics and the extension of sanitary education. The board examines plans for state buildings as to sewerage, ventilation and heating, examines and licenses embalmers and collects, compiles and disseminates information on sanitary subjects. Most of the present volume is occupied with studies of various diseases, their relations to climatic, soil, air and water conditions, their communicability, their control, etc., and should be very valuable to the medical profession as well as to local boards of health throughout the country.

Annual Report of the City Engineer of Providence, R. I., Otis F. Clapp, City Engineer.

The reports from this office usually contain something of special interest. Perhaps the most prominent work, from this point of view, in the present report is the repairing of a leak in Hope reservoir. This leak has been discharging for many years, a pipe well having been provided for collecting the water and discharging it into a sewer. When the reservoir was drawn off for cleaning the course of the leak was followed by open cut and tunnel from the pipe well, through all branches and windings to the inner wall. The embankment was found in good condition, and the channel of the leak was small and tortuous and near or at the original surface of the ground.

It was repaired using some concrete to connect with the solid rock below and carefully filling the excavation, all made finally in open cut, with a mixture of clay and soil. The repair took 3½ months. Drawings and photographs add to the clearness of the brief account of the work.

Other valuable features are the reports on the efficacy of the water filter, which averaged 97.3 per cent. of bacteria removed; on cost of maintaining filter plant, averaging $1.93 for cleaning beds, etc., and $2.90 for pumping water on beds, a total of $4.83 per million gallons; on results of an electrolysis survey; and on the results of the chemical precipitation method of treating sewage which is in use, showing average cost of chemical precipitation of $3.50 and of sludge disposal $3.10, a total of $6.60 per million gallons of sewage treated.

The standard forms of reporting summaries of water works statistics are used.

New Publications.

Instructions to Inspectors on Reinforced Concrete Construction. Second Edition. By Geo. P. Carver, 22 pp., paper, 50 cents. Payson Publishing Co., Beverly, Mass.

There is evidently a demand for this book as this is the second edition within a short time. There have been a number of additions made and the book now includes general instructions to the inspector, points to watch with regard to construction and removal of forms, steel reinforcement and placing, machine and hand mixing and placing of concrete in bridge or arch work and in building construction. Methods of proportioning concrete, cost of concrete, of reinforcement, of forms and of building are stated, also instructions for stripping form work and waterproofing concrete. Formulas for design of reinforced concrete braces and tables of safe loads of reinforced concrete columns, materials for concrete, spread of footings, quantities of materials in concrete are given in the last five pages. The basis of the book is found in the specifications for cement of the American Society for Testing Materials, instructions to inspectors on reinforced concrete arch construction on the viaduct work of the Key West extension of the Florida East Coast railway and to inspectors on the U. S. Shoe Machinery Company's plant.

Garbage Crematories in America. By William Mayo Venable, M. S. 200 pp. cloth. $2. John Wiley & Sons, New York.

Mr. Venable's book is an interesting contribution to the literature on garbage disposal in America. Prior to the appearance of Venable's, Parson's and Branch's books, which was almost simultaneous, there was nothing in book form regarding American practice. One reason for this has been the lack of satisfactory solutions of the garbage disposal problem in this country and our dependence, therefore, upon English books. Mr. Venable states the difference between English and American practice to be in the collection, the English system collecting garbage, refuse and ashes together and running them all through the crematory together. Many English plants are able to produce an appreciable amount of steam for power purposes, thus returning at least a portion of the cost of operation. Americans, according to Mr. Venable, have formed the habit of separating the city refuse into two or three classes, roughly described above as garbage, refuse and ashes. The separation in various cities is into the three classes, and into two classes, ashes forming a class alone in some and garbage a class alone in others. There is no generally distributed specific habit of separation, whatever may be the adherence to some one method in any one city.

In the summary the author gives recommendations as to methods of disposal in institutions, hotels, etc., with less than 15,000 population, when isolated and when in large cities; as to centers of population of 10,000 to 40,000 persons, where cremation is the only process advised, with or without steam utilization according to conditions; as to municipalities of over 40,000 population, where sorting and reduction are also considered; and as to cities of over 200,000 population, where all methods of separation, collection and disposal are considered and various combinations are proposed according to the local conditions.

The chapter on quantities of waste collects the information which has been floating around, but is as yet very deficient in detail as well as in volume, especially as to the experience in any large number of cities. The principles of crematory design are stated with the leaning toward separation of garbage and the combustible refuse which is definitely stated early in the books as the author's preference. The various furnaces which have been used in this country are described in more or less detail and lists of the patents on them accompany the descriptions. The principal English furnaces are also described and illustrated. Materials and methods of construction receive some attention but are not exhaustively considered. There is also a chapter on crematory chimneys.

The collection of all this information in a single book is a great convenience, showing, as it does, the efforts which have been made toward the solution of a troublesome problem, and at the same time the failures to devise collection and disposal methods which are entirely satisfactory. The strong implication and in fact to some extent the teaching of the book is that each city must study thoroughly its own problem and proceed under competent technical guidance. Past failures have been caused by the ignorance of city officials and contractors of the local conditions and the best methods of meeting them.

While the book may not be much of an aid in the direct application of the principles it advocates, it will be of value in showing what progress has been made at this time and what the indications from past practice are as to future developments.

The Adjustments of the Engineers' Transit and Level. By Howard C. Ives, C. E. 15 pp. boards, 25 cents. John Wiley and Sons, New York City.

Mr. Ives has prepared a very handy little book for the use of his classes, which is equally valuable for practicing instrument men. It is small and easily carried in pocket or instrument box. But the principal advantage of the book is that if one gets its principle in mind and uses the author's method of making sketches to show what the errors are, he does not need the book, for he can renew his acquaintance with the method of making an adjustment by making the sketch from his knowledge of the principle on which the error and its correction depend. Adjustment of line of collimation and bubble, to axis of telescope and to axis of instrument are described for the Y level and the dumpy level, and of the plate levels, telescope level, line of collimation and vernier of vertical circle for the transit are described, covering the adjustments required in the field of these two commonest instruments.

Economics of Road Construction. By Halbert Powers Gillette. Second edition enlarged. 49 pp. cloth, $1 net. Engineering News Publishing Co., New York City.

The first edition of this book was reviewed in vol. xxii, p. 183, of MUNICIPAL ENGINEERING. The additions in the second edition consist of a four-page chapter on repairs and maintenance, and another suggesting improvements in road specifications. Intermittent repair by means of road roller picking up the surface with aid of men with picks, respreading stone,

sprinkling and rolling down again is claimed to be best and most economical, the author's figures showing 3.3 cents per square yard as the total cost. Sandstone macadam with heavy crown is described and the wear and cost of repair of limestone and trap macadam of 6- and 2-inch thickness is compared, also the cost of resurfacing.

The chapter on specifications attacks the provisions in the New York and Massachusetts state road specifications on sizes of broken stone, kinds of stone, depth of pavement, final surfacing, material for embankments, thickness and width of pavement. On some of these points the author has good grounds for his objections. Others are open to differences of opinion and should not be subjected to the caustic comment for which the author is somewhat noted.

Notes on Hydrology and its application to the problems of hydraulic engineering. By Daniel W. Mead, M. Am. Soc. C. E. 202 pp. cloth. D. W. Mead, Univ. of Wisconsin, Madison, Wis.

In this book Professor Mead has made a collection of data, mainly for the use of students attending his lectures, which are not to be found in other book on hydraulics. Hydrology is defined as treating of the properties, laws and phenomena of water, of its physical, chemical and physiological relations, of its distribution and occurrence over the earth's surface and within the geological strata, and of its sanitary, agricultural and commercial relations. The chapters of the book therefore treat of the physical properties of water, pure and carrying various matters in solution, as a liquid and as steam, of the circulation of water on the earth and in the atmosphere; of the relation of geology to the occurrence of ground water, especially as the author has heretofore worked it out in detail for northern Illinois, Wisconsin and Iowa; the drainage basins of the United States; rainfall data; stream flow; ground water; rivers and lakes; stream velocity curves; ice influences and water analyses. Each chapter has a full bibliography of books and articles from which the data published are collected and where fuller material for study may be obtained. The book contains much that is interesting and valuable, arranged in convenient form.

Hydraulics with Working Tables. By E. S. Bellasis, M. Inst. C. E., Executive engineer in the irrigation branch of the public works department of India. 302 pp. cloth. $3.75. including duty. Rivington's, London, Eng.

The author believes this book necessary on account of the recent advances in the science and to expand and develop the branch of hydraulics relating to flow in open channels, in which he has had special opportunities for varied experience. He has also made a comparison of the various coefficients in hydraulic formulae which have been developed by various experimenters and shows the classes of conditions to which they are severally applicable. It is very evident that the book contains the results of much personal experience, especially in the section devoted to channels, and it will be particularly valuable to engineers on irrigation and power projects on this account.

The first five chapters cover the usual ground of definition, statement of general principles and formulae, phenomena and methods of calculation of flow through orifices, weirs and pipes. The sixth chapter is devoted to uniform flow and the seventh to variable flow in open channels. These chapters are particularly full, occupying one-third of the book, and are the real basis on which the new book is justified. The last three chapters are no less valuable, giving the methods of making hydraulic observations, particularly in open channels, the phenomena of unsteady flow from orifices and in open channels and the dynamic effect of flowing water.

The book does fill a need which irrigation engineers especially have felt in common with the author.

Earth Dams; a Study. By Burr Bassell, M. Am. Soc. C. E. 70 pp. Cloth $1. Enginering News Publishing Co., New York City.

In this book the author has made a very careful and full study of the subject of earth dams. He has put the scattered information on this subject in good shape and added to it the description of the construction of a successful high earth dam of his own design, so that we have the results of both theory and practice before us.

The introductory chapter gives a classification of dams. The second chapter gives short studies of catchment areas, reservoir basins and dam sites. The third makes a careful outline study of soils and puddle. Other chapters give full descriptions of the Tabeaud dam, built by the author, and example of various types of earth dams, with and without puddle-trenches, cores and faces and core walls of brick, rubble or concrete masonry, composite structures, rock fill and hydraulic dams.

The author's conclusions are drawn in the last chapter. Appendices give data regarding earth dams of heights from 55 to 125 feet and a list of reference books on the subject.

The author seems to be well prepared for his task and has made a book which should be in the hands of every hydraulic engineer.

ORGANIZATIONS AND INDIVIDUALS

Chicago Cement Show—National Association of Cement Users—Electrical Engineers—Technical Meetings—Mechanical Engineering Laboratory—Civil Service Examinations—F. R. Meier—Personal Notes.

The Chicago Cement Show.

The first cement show of the Cement Products Exhibition Company, held at the Coliseum in Chicago December 17 to 21, 1907, was considered successful from every point of view. The exhibits were practically all in position at the opening of the show on Tuesday evening, the 17th, the visitors came in crowds on the first night and in large numbers on all the other days up to and including Saturday night, and they kept all the exhibitors busy demonstrating their apparatus and materials, taking names and addresses and orders for future delivery. It was expected that the free tickets for Tuesday night, with which all the exhibitors were supplied, would bring a large crowd on that night and they did, but the crowds kept coming all week. Many curiosity seekers were present the first night, but those who came later were interested in some part of the show enough to pay 50 cents for each admission or to induce some exhibitor to pay his admission fee. As a consequence the undesirable sightseer with no purpose but the gratification of his curiosity was largely eliminated and some line of exhibitors had opportunity to put their talk about their wares into ears ready to receive it. So while some of the sightseers complained a little about the payment of the admission fee for a privilege to purchase from those extending the invitation to the show, and some exhibitiors complained because they could not issue free tickets to their friends and prospective customers, there was very general satisfaction with the plan for admissions adopted by the management. A greater crowd would have been well nigh unmanageable and a demonstrator loses a large share of his stock of patience when, after a long demonstration he finds he has been talking to some one who has only a passing curiosity to "see the wheels go round."

The class of exhibitors was somewhat different from that observed at previous cement shows and was apparently different from that expected at the coming Buffalo show, judged from the advance list of exhibitors. The principal development since last year has been in the lines of reinforcing for concrete, artistic uses of concrete, concrete mixers and water-proofing. This development is well shown in the list of exhibitors in which these classes and that of cement manufacturers rather overshadowed the cement block and post machines and smaller cement supplies. A classification of the exhibitors according to their most prominent feature is rather rough because some of them have side lines in other classes but it will serve to show the tendencies of the trade. There were approximately 15 exhibits of cement manufacturers, 13 of machinery and supplies for cement manufacturers, 12 of reinforcing materials and systems, 6 of concrete mixers, 17 of concrete block and brick machines and wall molds, 4 of artificial stone and art work, 7 of post, tile and shingle machines, 16 of other machinery and supplies for cement users, 4 of waterproofing, 2 of testing laboratories, 2 of organizations of the trades, 1 photographer, 11 periodicals. Twenty-one spaces, or about 15 per cent of the space in the coliseum proper, were vacant.

The Northwestern Cement Products Association was induced, almost at the last moment, to move forward its annual convention from the selected date in the middle of January and to meet in connection with the cement show. Possibly 200 were brought to the show by this convention, and the character of the crowds during Wednesday and Thursday was modified somewhat by the presence of these gentlemen. It was interesting to note that the crowds in the evening were largely composed of Chicago people, even when the day visitors were largely from outside the city.

The lectures and discussions begun in the proceedings of the Cement Pro-

ducts Association were continued on Friday and Saturday under the management of the Exhibition Company.

The papers before the Northwestern Cement Products Association included "The Use of Concrete and Cement Blocks on the Farm," by H. E. Murphy, of Manitowoc, Wis.; "Status of the Cement Industry in Iowa," by R. G. Coutts, Grinnell, Iowa; "The Use of Concrete and Concrete Pipe as Applied to Irrigation," by E. T. Perkins, engineer of the U. S. Reclamation Service; "Concrete in the Pabst Country Place at Oconomowoc," by R. E. Newton, Milwaukee, Wis.; "Forms," by Ernest McCullough, C. E., Chicago, Ill.; "Construction of Concrete Sidewalks," by A. B. Pederson, Hankinson, N. D.; "Concrete Blocks," by S. B. Newberry, Sandusky, O.; "General Uses of Cement Pipe," by L. L. Bingham, Estherville, Iowa; "Advance in Reinforced Concrete Construction," by C. A. P. Turner, Minneapolis, Minn.; "Cement Pipe as Used for Drainage and Irrigation," by F. A. B. Patterson, Fairmount, Minn., and "The Concrete That Made Milwaukee Famous," by J. P. Sherer, of Milwaukee, Wis.

The papers presented on Friday and Saturday for the Cement Products Exhibition Company included the following: "Concrete in Public Parks," by Linn White, Chief Engineer, South Park Commissioners, Chicago; "Waterproofing," by J. M. Rauhoff, Chicago; "Selection of Concrete Aggregates," by S. W. Curtiss, Chicago; "Reinforced Concrete," by T. L. Condron, Chicago; "Tests on Reinforced Concrete," by D. A. Abrams, University of Illinois, Urbana.

Several of these papers will be given in full or in abstract and with discussions in MUNICIPAL ENGINEERING. One criticism made of many of them was regarding their commercial nature, as they exploited special methods or apparatus, but in such a gathering as would be brought together by a commercial show there could be but little real complaint on this point and, after all, most of the advances are made from the commercial side and the earliest information about them must come from those who have been concerned in the development.

American Institute of Electrical Engineers.

At a meeting of the American Institute of Electrical Engineers, December 13, H. H. Wait, assistant electrical engineer of the Western Electric Company, read a paper on "An Exhaust Steam Turbine Plant," in which he described the installation of power at the mill of the Wisconsin Steel Co., South Chicago, as follows:

Here a low-pressure Rateau impulse turbine utilizes the exhaust from a reversible rolling mill engine. This engine when running showed an average of 1,010 i. h. p. and a steam consumption of 54 lbs. per average i. h. p., during actual running. This engine takes steam for nearly full stroke when starting the passes and runs on very light load the rest of the time. The h. p. and the torque are very high on starting.

The steam passes from the primary engine to a receiver, thence to an accumulator, and from there to the turbine and condenser. The receiver consists of a vertical tank with numerous baffle plates and is provided with oil and water drains. The accumulator consists of a large horizontal cylindrical tank divided by a diaphragm into two decks, in each of which are a number of perforated steam pipes immersed in water. The steam is sprayed through the mass of the water and gives up some of its heat to the water, depending on the condensation. Should the steam supply drop the pressure in the accumulator must drop, and under such a reduction the water at a temperature corresponding to the former pressure gives off steam. The normal operation is about 2 lbs. above atmospheric pressure. The size of the accumulator is such that the turbine will operate for some seven minutes before live steam is admitted to the accumulator.

During three months in which the steel plant was running at nearly full capacity the turbine delivered an average of 51 per cent. of the total k. w. hrs. possible at full load for this time and at a cost of about 0.3 of a cent per k. w. hr.

During the evening a paper by W. S. Finley, Jr., assistant engineer to the superintendent of motive power, Interborough Rapid Transit Co., New York City, on "The Ratio of Heating Surface to Grate Surface as a Factor in Power Plant Design," was discussed, the theory advanced being, that great increase in boiler capacity can be maintained, without material sacrifice in efficiency, if there is a proportional increase in grate surface. It is considered possible that in increasing the grate surface the conditions for combustion, heat distribution and transfer could be much improved. Features of a change made at the 59th st. plant of the Interborough Rapid Transit Co., ..ew York City, were outlined as following this theory. Under the mud drum of each of 18 water-tube boilers a second stoker was installed. The boiler capacity was increased 71 per cent. with no loss in economy. At 80 per cent. increased steaming capacity the boiler efficiency was lowered only 2 or 3 per cent. Mr. Finlay claimed that by such increase

in grate surface the first cost of a plant would be cut down 19 or 20 per cent. and that total operating expenses would be reduced from 5 to 10 per cent. depending on the load factor of the plant.

The discussions were in general quite unfavorable to the theory. Prof. C. E. Lucke, of Columbia University, in analyzing the results of the tests at the Interborough station, stated that some conditions not stated in the paper might reverse the cost reductions quoted; as an instance it was stated that an appreciably higher flue temperature under furnace conditions outlined would materially increase expenses.

Mr. J. B. Sparrow, Chief Engineer, New York Edison Co., stated that the data in Mr. Finlay's paper appeared to show a fair performance under single stoker operation and a poor one with the double stoker arrangement. At the Edison plant a greatly increased rate of fuel combustion had been maintained with increased boiler capacity and with little decrease in combined efficiency of the boiler if the operation was maintained merely at peak loads.

The National Association of Cement Users.

The next convention of the National Association of Cement Users will be held in the concert hall of the Tech Theater building, Buffalo, N. Y., on January 21 to 24. The exhibition will be open from Monday noon, January 20, to Saturday midnight, January 25.

The program includes papers on "Cement Sidewalks" by C. W. Boynton, Chicago, Ill.; "Elementary Mechanics of Reinforced Concrete" by Prof. W. K. Hatt, Purdue Univ., Lafayette, Ind.; "Factory-Built Concrete" by W. H. Mason, Stewartsville, N. J.; "Concrete as a Plastic Material for the Expression of Architectural Ideals" by Irving K. Pond, Architect, Chicago, Ill.; "Artistic Effects in Reinforced Concrete" by Ross F. Tucker, New York City; "Exposed Selected Aggregates in Monolithic Concrete Construction" by Albert Moyer, New York City; "Progress in Manufacture and Use of Cement Building Blocks," by A. N. Pierson, East Orange, N. J.; "Practical Methods Involved in the Erection of a Reinforced Concrete Building," by H. H. Fox, New York City; "The Unit vs. the Loose Bar System of Reinforced Concrete Construction" by Emile G. Perrot. Architect, Philadelphia, Pa. There are a number of other subjects on the preliminary program for which speakers have not yet been obtained, and each of the committees is given a time to make a report. An hour is given each morning to a meeting of those interested in the fields covered by these committees.

The list of exhibitors already procured for the show is large and promises to be larger than it was at Chicago last year.

The attendance will be drawn largely from a new field. The first three conventions drew from the same States, Indiana, Illinois and Wisconsin most largely, with many of the same faces each year. But few of these will appear at Buffalo on account of the expense of the trip and possibly in a few cases because the Chicago show took the place for them that the Association has heretofore. Undoubtedly the interest in concrete construction in the district about Buffalo is great and will insure a good attendance, and those from greater distances will be present as usual.

New Mechanical Engineering Laboratories.

The Rensselaer Polytechnic Institute announces that it has inaugurated courses in Mechanical Engineering and in Electrical Engineering—leading to the degrees of Mechanical Engineer and Electrical Engineer—of the same high character and of the same thoroughness and generality which has made its course in Civil Engineering famous for the past three quarters of a century. The gift of $1,000,000 by Mrs. Russell Sage insures laboratories in Mechanical and Electrical Engineering unsurpassed by those of any other school of engineering.

Technical Meetings.

The first annual meeting of the National Drainage Association was held in Baltimore, November 25, 26 and 27. The association was organized in Oklahoma City in December, 1906, to promote interest in and further legislation for the reclamation of swamp lands. Little attention was paid at the first congress to the engineering features of reclamation, but the advantages to be gained by swamp drainage were discussed. The next meeting of the association will be held in Washington, D. C., next May. Officers for the ensuing year were elected as follows: President, Hon. N. P. Broward, Governor of Florida; first vice-president, Dr. James Mosley, Delaware; sec-

ond vice-president, W. S. Braddock, Wisconsin; treasurer, B. H. Griswold. A secretary was not elected at this congress, but William N. Hill, of Baltimore, acted as such during the convention.

The annual meeting of the American Society of Civil Engineers will be held in New York City January 15. Chas. Warren Hunt, secretary, 220 West 57th str., New York City.

The fourth annual convention of the Wood Preservers' Asociation will be held at Kansas City, Mo., January 21, with headquarters at the Baltimore Hotel. Topics for discusion have been assigned as follows: (1) Impurities or foreign matters in creosote oil that should be avoided. (2) Cylinder cars, tracks, and guard rails; how they should best be constructed. (3) Should the supply tank be overhead or under ground? (4) Best methods of measuring oil. (5) Best method of impregnating wood with preservatives of ordinary use, when pressure is not available. (6) Method of treating wood that is refractory to treatment and at the same time very subject to decay. (7) Results thus far accomplished in the United States in preserving wood. (8) Best method of treating piles to use in southern waters. (9) Can freshly-cut timber be well treated, and how? (10) Best method of keeping records of treated ties in the track. (11) Compilation of various data in reference to the life of treated timbers, especially ties, in the United States under all treatment. (12) Best practice of treating butts of telegraph, telephone and signal poles. (13) Is it necessary, practical or otherwise, to correct oil measurements for temperature? C. W. Berry, secretary, Laramie, Wyoming.

The fourth annual convention of the Iowa Association of Cement Users will be held in Des Moines, Iowa, February 19, 20 and 21, 1908, with headquarters at the Savery Hotel. Space for exhibition purposes will be allotted by the square foot, and applications should be made to the secretary or to J. R. Hubbart, manager of the Savery Hotel. Ira. A. Williams, sec'y., Ames, Iowa.

The twenty-second annual convention of the National Brick Manufacturers' Association will be held at Columbus, Ohio, February 3, 4, 5, 6, 7 and 8, 1908, and the National Paving Brick Manufacturers' Association, whose members are also members of the National Brick Manufacturers' Association, will hold separate sessions February 3 and 4.

The twenty-seventh annual convention of the Iowa Brick and Tile Association will be held at Des Moines, Iowa, January 22 and 23, 1908.

The thirtieth annual convention of the Illinois Clay Workers' Association will be held at Peoria, Illinois, January 14, 15, and 16, with headquarters at the National Hotel.

The American Ceramic Society will hold a meeting at Columbus, Ohio, February 3 and 4, with headquarters at the Hartman Hotel.

The annual Clay Workers' Institute will be held at the department of ceramics at the University of Illinois, January 6 to 10. Addresses will be made as follows: "The Preparation of Clays," Prof. A. V. Bleininger; "Clay Working Machinery," R. T. Stull; "Die Construction," R. T. Stull; "Manufacture of Auger-Machine Front Brick, Without Repressing," R. T. Stull; "Drying of Clay Ware," and the "Vitrification of Clays," Prof. A. V. Bleininger; "The Manufacture of White Ware," Hereford Hope; "Controlling Temperature and Draft of Kilns," Prof. Bleininger.

The eighth annual convention of the Wisconsin Clay Workers' Association will be held at Milwaukee, Wis., February 12, 13 and 14, 1908, with headquarters at the Hotel Blatz. Oscar Wilson, sec'y., Menominie, Wis.

The fourth annual convention of the National Asociation of Cement Users will be held at Buffalo, N. Y., January 20 to 25, 1908. Application blanks for space, diagrams of the floor plan and other printed matter have been mailed to possible exhibitors, and those who have not received them can apply to Dal H. Lewis, 760 Main street, Buffalo, N. Y., who has been appointed manager for the convention.

The Washington Society of Engineers held a meeting December 11 and elected officers for the ensuing year, as follows: President, A. P. Davis, chief engineer of the reclamation service; vice-president, D. S. Caril, chief engineer of the Capital Traction Company; secretary, John C. White, civil engineer in the geological survey; treasurer, T. F. Hayford, of the coast survey. Directors—Philander Betts, Dr. T. T. Day, Robert Franham, Jr., T. E. Woodward, M. O. Leighton, and Asa Phillips. The society voted to change its headquarters from 1729 15th st. to 12th and G sts., on account of the adaptability of the new quarters and the probability of the 15th st. building being torn down in the near future. After the election of officers and a

short business meeting, David B. Rushmore, of the American Institute of Electrical Engineers, delivered a lecture on "The Practice in Long Distance Power Transmission," telling of the successful attempts in increasing voltage and the distance of its transmission of the past several years, and giving in detail plans for the coming year of the enormous record-breaking generator plants contemplated. According to the lecturer, there will be several power plants in this country the coming year—one in the northwest and another in the southwest—which will be able to transmit 100,000 volts—not quite twice the amount of electricity generated and transmitted to any distance of reasonable length in the United States at present. He asserted that in time such a large quantity of electricity with an improved transmission apparatus will be delivered fully twice as far as is now done. The perfecting of this new machinery and other equipment, the lecturer said, was in progress, and its possibilities are enormous. A portion of the lecture was devoted to various theories advanced by eminent electrical engineers on the reduction of current loss and its entire elimination in long-distance transmission. The lecture was illustrated and a number of views were exhibited showing the change in construction of dams and machinery used in power generation from those a few years ago.

The annual meeting of the Illinois Society of Engineers and Surveyors will be held at Champaign, Illinois, January 15, 16 and 17, 1908. E. E. R. Tratman, sec'y., 1636 Monadnock Bldg., Chicago.

The annual meeting of the Indiana Engineering Society will be held at Indianapolis, Indiana. January 16, 17 and 18. Charles Carroll Brown, sec'y., 408 Commercial Club Bldg.

The annual meeting of the American Society of Heating and Ventilating Engineers will be held in New York City, January 21, 22 and 23, 1908. W. M. Mackay, sec'y., 29 W. 39th st., New York City.

The annual meeting of the National Society for the Promotion of Industrial Education will be held at Chicago, January 23, 24 and 25. C. R. Richards sec'y, Columbia University New York City.

The Concrete Association of America, which is composed of men who are engaged in developing the correct use of concrete, has recently opened a permanent exhibition of concrete and cement products at the Brunswick Building, Fifth Avenue and 27th st., New York City. The real object of this exhibition is to show the architect, the builder and the owner who may have certain prejudices against the use of concrete in any but mass work, that the artistic and scientific treatment of the material has reached such a stage that it is not only safe and economical, but that it can be made beautiful. A permanent secretary is in attendance and will assist visitors in gaining any information not evident from the exhibits.

At a meeting of the New York section of the Illuminating Engineering Society, December 12, Bassett Jones, Jr., presented a paper on "The Relation of Architectural Principles to Illuminating Engineering Practice."

The annual meeting of the Ohio Engineering Society will be held at The Great Southern Hotel, Columbus, Ohio, on Feb. 11, 12 and 13, 1908. E. G. Bradbury, secretary, 85 N. High st., Columbus, O.

The national lumber and building material exposition will be held at the Casino Garden, Chicago, Ill., Feb. 10 to 15. At the same time will be held conventions of the Illinois Lumber Dealers' and the Illinois Masons' Supply Associations. Everitt W. Hyde, director, 1205 Hartford building, Chicago, Ill.

The annual meeting of the New England Waterworks Association will be held at the Hotel Brunswick, Copley Square, Boston, Mass., on Jan. 8, 1908. The papers will be "Experience with a Producer-Gas Plant" by Harry L. Thomas, Hingham, Mass.; "One Year's Practical Every Day Experience with an Automobile for Business, by a Water Works Man," by F. F. Forbes, Brookline, Mass.; "Action of Water on Water Pipes" by Freeland Howe, Jr., Norway, Me.

At the meeting of the New York Electrical Society held Dec. 18, H. H. Barnes, Jr., gave an informal talk on "What the Steam Turbine is Doing Today."

The fifth annual dinner of the Municipal Engineers of the city of New York will be held Tuesday evening, Jan. 7, 1908, at Shanley's "Roman Court," 42d street and Broadway.

The Engineering Association of the South has elected Howard M. Jones, of Nashville, Tenn., president; H. H. Trabue, of Nashville, secretary and treasurer. Mr. Trabue is also president of the Nashville section of the Association; Arthur Page, of the At-

lanta, Ga., section; and W. S. Lee, of the Charlotte, N. C., section.

The International Brotherhood of Cement Workers will meet in Milwaukee, Wis., in September, 1908.

The Civic League of St. Louis issues a list of speakers on municipal questions and subjects of lectures which can be secured without cost except for the local expenses and stereopticon if used, for any improvement associations or any clubs in the city. This is an excellent method of satisfying the desire for information and instruction on these lines.

Civil Service Examinations.

The U. S. Civil Service Commission will hold examinations at the usual places as follows:

Jan. 8: Engineers and assistant engineers for places in the Indian Service in New Mexico, Oklahoma and Oregon, requiring knowledge of steam, electrical and heating practice; salaries $720 a year. Also general examinations on steam and electrical engineering, heating, refrigeration, gas and gasoline engines, and hydraulics, to fill future vacancies at $480 to $1,000 a year according to number of these subjects required and character of work. Also for first class steam engineer in Custodian Service at Omaha, Neb., at $1,200 a year. Also for civil engineer and superintendent of construction at $1,500 a year in Quartermaster's Department at Large for vacancies in Wyoming, Virginia, Maryland, Connecticut, Florida, Oklahoma, New Jersey, Iowa and Arizona. Also for mechanical and electrical draftsmen at $1,200 and $1,500 a year in the office of the Chief of Ordnance, War Department.

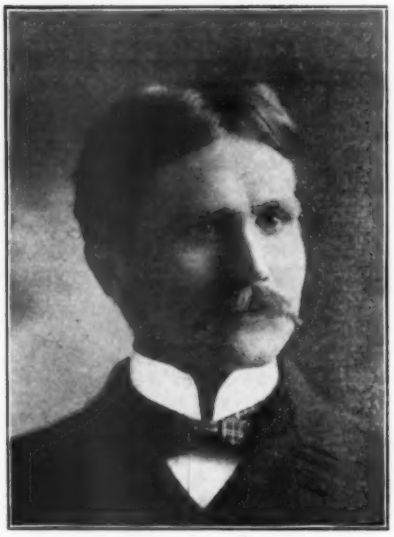
Jan. 15: Four aids on Coast and Geodetic Survey at $720 a year.

Jan. 22: Machinist in Government Printing Office. Also assistant engineer of tests in the testing laboratory at Watertown Arsenal, Mass., at $1,200 a year. Also for second-class or assistant steam engineer in the office of the Secretary of War at $720 a year. Also for teacher of mechanical drawing in Indian Service at Carlisle School, Pa., at $600 a year.

F. R. Meier.

The strong movement which has been made to preserve our remaining forests has begun to bear fruit not only in making a basis of public opinion favoring the appropriation of money for work by the recently constituted U. S. Forest Service in preserving and regaining forests and forest lands, but also in arousing a desire in the minds of wealthy landowners and in city and State forestry and park departments to conserve their forest lands and extend them. This calls for a new class of engineers and Mr. F. R. Meier, 1 Broadway, New York, is one of the first to enter the field as a Consulting Forester.

Mr. Meier is the son of a German government forester and has grown up in the atmosphere, and received the regular German education, being graduated as Forester at the Forest Academy, Eisenach, Germany. He came to this country a young man of



F. R. MEIER, New York City.

23, in 1890 and when the State Commission of Forestry was created in Pennsylvania in 1893 he was appointed forester to the commission to advise as to the best methods of forest restoration and forest management for Pennsylvania. He also made an estimate of the standing timber in the State. The first school of forestry started in this country was that at Cornell University and Mr. Meier laid out the forest nurseries for it. In 1902 the Geological Survey of New Jersey, then in charge of all State forest matters, appointed him forester and he was continued in office under the State Forest Commission in 1905. In 1907 he became Consulting Forester to the commission.

Mr. Meier has for some years man-

aged the forest estates of T. A. Havemeyer, 5,000 acres, and A. S. Hewitt, 25,000 acres, where the greatest present and continued returns from the forests are desired, as well as improvement of the estates for park purposes. He prepared working plans for the forests on the watersheds of the Newark, N. J., Hartford, Conn., Lambertville, N. J., watersheds, etc.

The value of proper forest management has long been understood by water companies, but the full measure of great results yet to be had is not generally appreciated. The forest is the guardian of the water supply—on it greatly depends the purity, regularity and volume of the flow, and the proper care and maintenance of its individual members not only insures protection of the storage basins and reservoirs, but establishes a source of considerable revenue from judicious thinnings and improvement cuttings. The thinning process should be done with most kindly and intelligent care that the health, thrift and vigor of the trees may be increased without disturbing the natural wild grace and beauty of the scenery. Planting of suitable and profitable trees is also a subject for most careful consideration.

The scientific laying out of parks, the planting of street and ornamental trees, tree surgery in all its branches is a subject which should appeal and more and more every year is appealing to officers of municipalities and to individual owners as well.

Personal Notes.

Ernest Nathan has been elected mayor at Rome, N. Y.

George A. Hibbard has been elected mayor, at Boston, Mass.

John Brady has been elected City Engineer of Ottumwa, Iowa.

Howard R. Smart has been appointed town engineer, at Lincoln, R. I.

J. P. Claybrook has been reappointed city engineer, at Louisville, Ky.

John M. McFarland has been re-elected mayor, at Rossville, Tenn.

Julian Kendrick has been re-elected city engineer, at Birmingham, Ala.

Foster Crowell, consulting engineer of New York City, has been appointed commissioner of street cleaning of that city, to succeed Dr. Walter Bensel, who resigned to resume his former position as sanitary superintendent of the department of health.

E. Y. Allen has been appointed village engineer, at South Orange, N. Y., succeeding E. R. Halsey, resigned.

John C. McMynn has resigned his connection with Robert W. Hunt & Co., of Chicago, taking effect December 1, 1907.

C. R. Allen, of Ottumwa, Iowa, is in charge of the engineering work in Albia, Fairfield, Osceola and Sigourney, Iowa.

John B. Van Fossen, mayor of Ypsilanti, Mich., committed suicide November 29, by shooting himself. He was 48 years old.

Arthur O'Brien, a member of the Fort Orange Construction Co., of Troy, N. Y., has been appointed city engineer of Utica, N. Y.

John E. Haight, city engineer at Shelbyville, Ky., was run down and killed by a railway train, December 13, near Independence, Ky.

H. L. Sweet, of Fond du Lac, Wisconsin, has been appointed city engineer, to serve jointly between Neenah and Menasha, Wisconsin.

Leopold Mercader, formerly assistant engineer in the United States highway work, has been appointed bridge inspector of the Department of the Interior of Porto Rico.

J. P. Jackson, Professor of Electrical Engineering at The Pennsylvania State College, has recently been appointed by the Board of Trustees at that institution to the position of Dean of the School of Engineering.

Charles H. Kluegel, M. Am. Soc. C. E., has been appointed Territorial Engineer of Hawaii, with headquarters at Honolulu, and Marston Campbell has been appointed superintendent of public works of the same territory.

Robert Hoffman, M. Am. Soc. C. E., has been appointed city engineer at Cleveland, Ohio, to succeed William J. Carter, who resigned to open an office for general practice of civil engineering in the Rockefeller Building, Cleveland.

Bernard H. Muehle, one of the best known civil engineers in the middle states died at his home in Detroit, Michigan, November 28. Mr. Muehle was an expert engineer in the government's service for 37 years. He had been ill since September.

Dow & Smith, 24 E. 21st st., New York City, have been retained by the City of Philadelphia to organize and carry on their inspection system covering all the asphalt pavements to be laid in that city during the coming year, about 1,000,000 square yards. Many other cities have already retained them in a similar capacity, recognizing that their services, by insuring the proper character of the workmanship and materials used, tend to eliminate many of the unsatisfactory features of the present much discussed system of guarantees.

MACHINERY AND TRADE

The Hercules at Buffalo.

The Century Cement Machine Co. will have an unusually attractive exhibit of "Hercules" machines and their product at the coming convention in Buffalo, N. Y.

This company believes in the old maxim, "Seeing is believing" and have accordingly arranged for sections 94, 95, 96, 97, 98 and 99 where they will be glad to meet all those interested in up-to-date appliances for the manufacture of concrete building stone.

It might be well to mention that the Century Cement Machine Co. is one of the oldest concerns making block machinery and their "Hercules" machines are used in all parts of the civilized world. Judging from former displays made by this company at Indianapolis, Milwaukee and Chicago, their exhibit at Buffalo will be an attractive feature of the convention.

New York City Can Lay Patented Pavement.

On December 20, 1907, the New York State Court of Appeals rendered an unusually important decision on a vigorously contested point, the right of the city of New York to lay a patented pavement. The present decision of the Court of last resort decided in favor of the legality of a contract awarded more than five years ago to Warren Brothers Company for laying bitulithic, a patented pavement, on 72nd Street Boulevard in New York City.

The litigation thus ended, was begun nearly six years ago and its progress has been shown in MUNICIPAL ENGINEERING from time to time in articles which have appeared in vol. xxv, pp. 44, 117 and 428, and vol. xxvi, pp. 45 and 122.

Bitulithic being a patented pavement, its adoption was confronted by a provision of the charter of Greater New York with respect to patented pavements, an article which reads as follows:

Section 1554. Except for repairs, no patented pavement shall be laid and no patented article shall be advertised for, contracted for or purchased, except under such circumstances that there can be a fair and reasonable opportunity for competition, and conditions to secure which shall be prescribed by the Board of Estimate and Apportionment.

After one or two trials, a form of specification was prepared which the legal department of the city thought strictly complied with the suggestions of the Court and the Park Board advertised for proposals for paving Seventy-second Street Boulevard.

The letting of the contract was enjoined as described in one of the articles referred to, the Appellate Division stating that the city had misunderstood the instructions of the Court in the former case and declared the contract previously executed "ultra vires and void."

In the meantime, Mayor Low's administration had terminated and the suceeding administration resolved to annul the contract and failed to appeal the case to the Court of Appeals, and Warren Brothers Company, not being a party to the action commenced before the award of the contract, could not appeal, and the street was paved with asphalt blocks.

The present decision is in a test case brought by Warren Brothers Company against the city of New York for damages on account of abrogation of contract, and all questions involved and at issue in the previous cases were covered. The trial court decided adversely, following the previous decision of the Appellate Division, which in turn again by a closely divided court, maintained its previous decision, declaring the contract void.

The case just decided by the Court of Appeals is the first time the much contested question was presented to the court of last resort in New York State; sustains the legality of the bitulithic Seventy-second Street Boulevard contract and awards Warren Brothers Company the damages asked for with costs. The decision of the court is: "The judgment reversed and judgment ordered for plaintiff on submitted case for $5,000 with costs in both courts." The case was argued by J. M. Head and Chase Mellen for Warren Brothers Company, L. L. Kel-

logg for the Barber Asphalt Paving Company, and Wm. B. Ellison, corporation Counsel for the city of New York.

This decision is not only important in permitting Greater New York to lay pavements though patented, but also to use other patented articles, such as fire apparatus, water meters, etc. It will be observed by reference to the section of the New York charter quoted that the same restrictions regarding patented pavements apply to oher patented articles, and the unsettled legal interpretation of the charter has been a serious handicap to the city in the operation of all the departments. The matter now seems to be clearly and finally disposed of.

A New Idea in Shovel Manufacture.

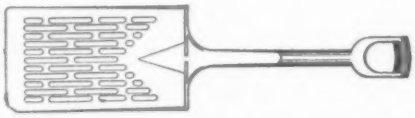
A new idea in shovel manufacture has been developed by the Conneaut Shovel Co., Conneaut, Ohio, which manufactures shovels under the patent of Henry Mikola designed to cause the wear to come on the heel and the point of the shovel rather than in the center, thus promoting long life. This is done by dropping the point of the shovel, so as to prevent any bearings of the center upon the surface from which material is being removed. A radical departure has been made by this company in the method of designing shovels for special requirements in that it sends a man to visit plants where shovels are required, to examine the conditions under which they will be used. It is well known by users of a large number of shovels that the same article is unsuitable for use under all conditions; thus a shovel for removing the material from a smooth, hard surface, as a concrete floor, will be entirely unsuitable for shoveling from the top of a pile of stone, coke or ore, or from a pile resting upon soft earth. The shovel expert examines the condition under which the shovel is to be used and the works then design a shovel in accordance with these conditions.

The plant in which these shovels are manufactured is equipped with the machinery of the old Ronberg Shovel Co., formerly of Ashtabula, Ohio, and has under construction special machinery which will more than double the present capacity. A handle mill will be erected adjacent to the plant, which is located on a plot of about five acres between the Nickel Plate and Lake Shore railroads with connecting sidings.

In the No. 1 grade of shovel, crucible steel of 0.60 carbon is used. The handles are of second growth of northern white ash. The plate steel used is first cut into proper shape in a large press, then passes to a set of rolls where the part attached to the shovel is reduced in thickness. It then passes to a machine for punching rivet holes for attaching the blade to the handle and the plate is then formed in a large press. The shovel handles are inserted by hand in another department. After the handles are attached, the shovel is tempered and strengthened at the point where the greatest resistance is necessary. All shovls pass through the hands of three inspectors before shipment and are guaranteed to the users, defective shovels being replaced free of charge, thus giving users the benefit of the elimination of brokn shovel expense.

The Concrete Spade.

Users of concrete have long had difficulty in producing a smooth surface on concrete deposited in forms and have been obliged to force the larger



SPADE FOR MAKING SMOOTH CONCRETE SURFACES.

stones back from the surface by a process of spading back which was not altogether satisfactory when well done, and then took much labor and time. The concrete spade changes all this and the operation can be performed perfectly and thoroughly with a minimum of labor and with great rapidity. The spade is used as a finishing tool, by means of which the concrete mass can be separated while in the form, the finer portion of cement being caused to flow toward the side of the form so as to give a more complete finish to the surface than would otherwise be presented. The tool is a perforated spade, so constructed as to give the best possible results as to the finish. It is shown in the accompanying cut.

Directions for using say: Mix your concrete in a flowing condition and place it in your forms; use the spade by placing it down beside the form and drawing it toward the center of the concrete mass, allowing the finer portions to pass through the perforations in the spade, while the coarser portions are drawn to the center. This

will make a complete finish without taking too much mortar from the center of your mass, making it water tight throughout the entire wall.

The tool is so simple that one is surprised that it was not invented earlier. It is made by the Concrete Spade Mfg. Co., 123 So. Clinton street, Chicago, Ill.

A Municipal Asphalt Plant in South America.

The following letter will be of interest, as showing the reception meeting a Cummer semi-portable asphalt paving plant sold to the city of Buenos Aires, Argentine Republic, South America, by the F. D. Cummer and Son Company, of Cleveland, O., some two years ago through their representative in South America, to whom the letter was addressed:

Replying to your favor of the 10th inst. I have the pleasure in informing you that the asphalt plant constructed by the F. D. Cummer and Son Co., of Cleveland, O., which you were commissioned to purchase by this municipality as per decree of the 9th December, 1905, has given complete satisfaction both by its very practical disposition, the material of its different parts and also by the excellent work obtained from safe.

Yours obediently,

CLARO C. DASSEN,

Director of Levels and Streets, P. W. Department, Municipality of Buenos Aires, Argentine Republic, S. A.

Asphalt Paving Plants and Machinery.

The well known firm of Hetherington and Berner, of Indianapolis, Ind., have issued a new catalogue describing their different forms of asphalt paving plants and their machinery for mixing and laying asphalt which will be found very valuable for any one wishing to know about asphalt pavements. It contains an excellent article, reprinted from MUNICIPAL ENGINEERING, giving the details of the method of making and laying sheet asphalt pavements, described by a practical expert of many years' experience. A short description of bituminous macadam pavements is also given. This is followed by a discussion of the working capacity of an asphalt plant and methods of computing it, descriptions of the various pieces of apparatus and methods of handling them, and of the various styles of plants made by the company, such as the municipal, the combination, the intermedial, the civic repair, the new model one-car railway and the economic plant. A copy of the booklet will be sent to the interested applicant to the firm at 19 W. South st., Indianapolis, Ind., in person or by mail.

Another Gold Medal for Studebakers.

The Studebaker Bros. Mfg. Co. have just been notified by the Jamestown Exposition Jury of Awards, that their exhibit of automobiles, street sprinklers, garbage and dump wagons, contractors' wagons, and trucks has been awarded a diploma and Gold Medal for vehicles of that class.

Trade Publications.

The latest publication of the Atlas Portland Cement Co., 30 Broad st., New York City, is a book, on "Reinforced Concrete in Factory Construction." This book contains several general chapters on concrete, concrete aggregates, methods and materials for reinforcing—ten chapters giving detailed descriptions of ten concrete factories and warehouses erected in various parts of th country by different systems, with photographs, section drawings and specifications furnished by the engineers in charge of the work. Copies of this work in paper will be sent to the members of the engineering and architectural professions and also manufacturers, free of charge. Cloth bound copies, 50c. each.

The Kilgore-Peteler Co., Minneapolis, Minn., have issued catalog No. 5 on industrial and mine cars, coal and ore handling machinery, chilled car wheels and industrial railways.

Bulletin No. 42 of the Universal Portland Cement Co. describes the manufacture and placing of concrete blocks in the north pier of Chicago harbor, and concrete locks on the Chicago drainage canal. Bulletin No. 43 shows the Shoshone dams and tunnels of the U. S. Reclamation Service and othr work in which Universal cement has been used.

The Sandusky Portland Cement Co., Sandusky, O., have issued a booklet about their new patented stainless white Portland cement.

The Universal Pole and Post Preserving Co., Circleville, O., issue a pamphlet on decay of poles, which describes their method of stopping and preventing it.

The Chamber of Commerce, of Roanoke, Va., issues a handsomely illustrated story of the advantages and history of the city, prepared for the Jamestown Exposition Committee by Secretary E. B. Jacobs.

Trade Notes.

CEMENT.

Easton, Pa.—The Alpha Portland Cement Co. has decided to increase its capital stock from $2,000,000 to $6,000,000 to meet the present requirements and rapid developments. W. M. McKelvy, president.

Davenport, Ia.—The Marquette Cement Co. has secured an attachment against the Tri-City Cement Products Co. to secure a payment of $458.91 for material furnished the defendants.

Tehachapi, Cal.—The Golden State Portland Cement Co. has been organized and will build a cement plant near here. George W. Parsons of Los Angeles, Cal., is treasurer of the company.

Gorham, N. Y.—The Flint Cement Co. has been incorporated with C. K. Benjamin and others, of Geneva, as directors.

Dunbar, Pa.—The Pittsburg Cement Corporation will erect a cement plant here, where it holds a 25-year lease on 5 acres of land. The officers of the company are: President, Alexander Gilmore; treasurer, A. L. Klouse; secretary, J. B. Johnson.

Portland, Ore.—The Oregon Portland Cement Co. has been organized and will build a plant on a tract of land the company owns near here. M. H. Clark, of Minneapolis, and W. R. McGarry and others are interested.

Wellston, O.—The Lehigh Cement Co. closed its plant Nov. 23, throwing 200 men out of employment.

Copenhagen, Tenn.—The large cement plant of the Dixie Portland Cement Co., located here, is about completed.

Blount Mountain, W. Va.—The Blount Mountain Portland Cement Co. has been incorporated and will build a plant here. The incorporators are G. A. Schneebeli, R. E. Schneebeli and E. Schneebeli, of Nazareth, Pa., H. M. Savors, of New York City, and George F. Coffin, of Easton, Pa.

Philadelphia, Pa.—William H. Ford, who has for several years been sales manager of the Kosmos Portland Cement Co., with officers at Louisville, Ky., has been elected vice-president of the William G. Hartranft Cement Co., of Philadelphia, and first vice-president and general manager of the William G. Hartranft Cement Co., of Canada, with general sales offices in Montreal.

Allentown, Pa.—The Allentown Portland Cement Co. has awarded the contract for erecting a cement plant at West Coplay, Pa., to The Fuller Engineering Co.

Ironton, O.—Negotiations for the purchase of the Ironton Portland Cement Company's plant here have been closed and D. Linn Gooch, of Covington, Ky., capitalists of Charleston, Toledo and Detroit, who come into possession of the plant, will organize a new company.

CONCRETE BLOCKS.

Chicago, Ill.—The Western Cement Construction Co. has been organized here to manufacture cement blocks, by L. Sorensen, G. Bendixen and P. H. Gray.

Parkersburg, W. Va.—The Ohio Valley Concrete and Building Co., has been incorporated to manufacture all kinds of building blocks, sewer pipe and other tile, and all products of sand and cement, by H. V. Reese, C. T. Parks, F. A. Parrish, and others.

Homestead, Ok.—The Cement Products' Mfg. Co., has been incorporated to manufacture products. A building will be erected at a cost of $50,000 and $20,000 worth of machinery purchased.

South Bend, Ind.—The Concrete Manufacturing & Construction Co., has been incorporated by R. S. Hollowell, Akin Moore, M. E. Knollock, W. H. Shonts and C. H. Dodge.

Springfield, Mo.—The Hydraulic Stone Co. has been organized here to manufacture concrete block, under the system of the American Hydraulic Stone Co., of Denver, Colo. William Reps, W. S. Tucker, W. E. Jewell, A. Dark, O. L. Call, W. F. Kissick, A. Calhoun, Dr. D. B. Farnsworth, Adolph Munder, J. L. Ludwigs, A. J. Spitznagel, and J. F. Dunckel are stockholders.

Lexington, Ky.—The Concrete Block & Coal Co., has been organized and incorporated by Samuel S. Yantis, Victor A. Bradley, and Ella D. Frazier.

Chicago, Ill.—The Raymond Concrete Pile Co. of Chicago and New York has been awarded the contract for placing the piles for the foundations of the new Smith street power house of the Coney Island and Brooklyn Railway Company at 9th and Smith sts. and Gowanus Canal, Brooklyn. Ford, Bacon & Davis are the enginpeers. A. Pasquini is the general contractor. Concrete piles were substituted at a conspicuous saving over wood piles, involving the disregarding of the water line, a considerable saving in concrete and the placing of heavier loads per pile.

Chicago, Ill.—The Raymond Concrete Pile Co., of Chicago and New York has received the contract for the concrete pile foundations of the South Side Carnegie Library, at 22nd and Carson sts., Pittsburg, Pa. Alden & Harlow are the architects, and W. F. Trimble & Sons the general contractors.

PURCHASE OF MACHINERY.

Lyons, Ia.—Special. The E. J. Ingwersen Mfg. Co., advises us that it is in market for a single air space block machine.

Dayton, Wash.—The question of purchasing a steam engine to run the rock crushers has been referred to the purchasing committee to investigate and report on.

Biwabik, Minn.—The Austin-Western Mfg. Co., of Chicago, was awarded the contract for a stone crusher and road roller, for $4100.

Ardmore, Ok.—Special. L. R. Marston, of the Artificial Stone & Construction Co., advises us that he is in the market for a rock crusher that will crush gravel from 3-ins. in diameter to ½-in. He requests that prices be quoted at Ardmore, Ok., set up in working order.

PURCHASE OF MATERIALS.

Guthrie, Ok.—Special. B. S. Reeves desires to know if any successful material or compound not patented, easily and cheaply obtained, has been found for water-proofing the face of concrete building blocks.

MISCELLANEOUS.

Chicago, Ill.—The Phillips Gasoline Engine & Motor Co. has been organized to manufacture engines, boilers,

etc., by N. G. Lancaster, A. K. Hanson, and I. M. Phillips.

Elkhart, Ind.—The Elkhart Gas Holder Co. has been incorporated by Eugene D. Conger, George Clapperton, and Frank M. Ayer, all of Grand Rapids, Mich.

Paterson, N. J.—The Lake Stone Co. has been incorporated by Cyrus Bordan, James G. Taylor, and Robert L. Shaw, to manufacture building material.

Portland, Me.—The Northwestern Concrete Paving Co. has been incorporated by L. A. Goudy, Carrol Brown and others.

Wilmington, Del.—Alexander Kelley, 1625 Lancaster ave., has invented a paving block for street railway purposes, made of stone or concrete, and so constructed that it will fit into a flange of street railway rail so that the rail will sustain the pressure put upon the blocks fitted therein, thus preventing the sagging down of the blocks and maintaining an even surface with the surface of the rails.

Patents Concerning Cement and Its Uses.

794,412. Expanded Metal. Julius Kahn, Detroit, Mich.

800,635. Process of Treating Lime. Carleton Ellis, Boston, Mass.

802,354. Process of Slaking Lime and Lime Containing Substances and Certain Novel Products of Said Process. Carleton Ellis, New York, N. Y.

803,506. Process for Hydrating Lime. James Reaney, Jr., Sherwood, Md.

805,745. 805,747. Water Proofed Masonry and Felt Waterproof Construction. Fred'k. N. Pease, New York, N. Y.

836,960. Wall Tie. Fredk. A. Cammann, St. Louis, Mo.

837,133. Wall Tie. Peter J. Shrum, Beaver Falls, Pa.

837,962. Retaining Wall Structure and Method of Building Same. Walter P. Rice, Cleveland, Ohio.

839,169. Tank and Supporting Structure Therefor. Albert K. Mansfield. Batavia, Ill.

839,812. Concrete Block Machine. Fred W. Cooley, Minneapolis, Minn.

839,818. Collapsible Core for Plastic Building Walls. Wm. E. De Lhorbe, Chicago, Ill.

839,819. Form for Plastic Building Walls. William E. DeLhorbe, Chicago, Ill.

839,842. Concrete Block Mold. John P. Heckman, Creston, O.

839,941. Machine for Molding Plastic Materials. Alfred Lutze, Halle-On-the-Saale, Germany.

839,942. Supporting Structure for Tanks. Albert K. Mansfield, Batavia, Ill.

840,006. Machine for making Concrete Building Blocks. John Miller, Arthur M. Haight and Walter T. Smith, Jackson, Mich.

840,016. Binding Sheet for Concrete Work. Julius H. Schlafly, Canton, O.

840,042. Dam. Wm. L. Church, Newton, Mass.

840,053. Metallic Structural Element for Buildings. Herbert L. Dunn, Hopedale, Mass.

840,067. Machine for Mixing Concrete and the Like. Wm. J. Judd, New York, N. Y.

840,076. Apparatus for Hydrating Lime. Max Mauran, Niagara Falls, N. Y.

840,224. Arch and Analogous Structure. Daniel B. Luten, Indianapolis, Ind.

840,263. Manufacturing of Fence Posts and Railroad Ties. Harvey M. Shellabarger, Wapello, Iowa.

840,293. Skeleton for Pipes, Reservoirs, and the Like of Strengthened Cement and Concrete. Fermand E. Bocquet, Paris, France.

840,571. Concrete and Metal Structure. John W. Linzee, Jr., Boston, Mass.

840,622. Fence Post. Ernest B. Harris, Mt. Olive, Ill.

840,637, 840,638. Mold and Apparatus for Constructing Hollow Concrete Columns. Fritz Locher, Zurich, Switzerland.

840,760. Wall Structure. Willis H. Fisher, Mt. Gilead, O.

840,893. Building Block. John Aitken, New York, N. Y.

840,907. Concrete Block Machine. Horace K. Burrill, Indianapolis, Ind.

840,911. Concrete Brick Machine. John Carlen, Havana, N. D.

840,924. Mold. Wm. P. Earnheart, Wilkinsburg, Pa.

840,937. Burial Vault. Albert H. Havard, Urbana, Ill.

840,964. Post Mold. Hiram Routt, Dallas Center, Iowa.

840,998. Apparatus for Constructing Walls of Concrete. Charles Dietrichs, Little Ferry, N. J.

841,041. Reinforcing Bar. Leigh Hunt, Iola, Kan.

841,036. Fence Post. Harry P. Morse, Dundee, Mich.

841,064. Telegraph and Trolley Pole. Thos. P. Stanley, Athens, Ga.

841,080. Fence Post Mold. Jacob B. Engstom, Manchester, Iowa.

841,136. Mold and Die for Making Building Blocks. Geo. F. Fisher, North Tonawanda, N. Y.

841,137. Block Lifting and Carrying Apparatus. Geo. F. Fisher, North Tonawanda, N. Y.

841,163. Concrete Base for Fence Posts. Robert J. Livengood, Harvel, Ill.

841,228. Block Molding Machine. Frederick Christian and Elmo H. Reed, Wichita, Kan.

841,273. Concrete Mixing Machine. Leonard C. Roberts, Nunda, N. Y.

841,367. Railway Roadbed. Luther R. Zollinger, Philadelphia, Pa.

841,414. Concrete Block and Wall. Frank D. Merchant, Minneapolis, Minn.

841,415. Concrete Block. Seth D. Merton, St. Louis, Mo.

841,463. Reinforced Concrete Column. Layton F. Smith, Baltimore, Md.

841,504. Contractible Mold. Geo. Georgenson and Joseph E. Hennen, Fond du Lac, Wis.

841,515. Block Molding Machine, John I. Hancock, Lestershire, N. Y.

841,532. Fence Post. Thos. E. Jones, Guinea, Va.

841,644. Machine for Making Fence Posts. Robert L. Dennison, Kansas City, Mo.

12,594. (reissue.) Manufacture of Imitation Stone Plates, Slabs or Tiles. Ludwig Hatschek, Voecklabruck, Austria-Hungary.

841,741. Reinforcing Bar. Geo. E. Vandenburgh, Washington, D. C.

841,788. Means for Making Stone Faced Brick. Wm. Lammersen, Los Angeles, Cal.

841,829. Method of Constructing Concrete Walls.

841,867. Mold for Constructing Hollow Concrete Walls. Henry J. Haupt, Leesburg, Va.

841,904. Means for Use in Erecting Metal Concrete Structures. Jas. Spelman, Chicago, Ill.

842,068. Method of Constructing Composite or Concrete Walls. David W. Bovee, Waterloo, Iowa.

842,109. Block Molding Machine. Paul Olson, Stoughton, Wis.

842,202. Railroad Track Construction. Solon G. Howe, Detroit, Mich.

842,206. Concrete Mixer. John E. Kenisell and Clarence C. Lowry, Detroit, Mich.

842,566. Apparatus for Laying Concrete Floors. Andrew Lanquist, Chicago, Ill.

842,722. Mold for Concrete Construction. Jas. F. Swinnerton, New York, N. Y.

842,770. Adjustable Trowel. Patrick F. Connelly, Sioux Falls, S. D.

842,812. Collapsible Form for Concrete Work. Oliver S. Riblet, Erie, Pa.

842,848. Process of Burning Cement. Chas. A. Matcham, Allentown, Pa.

842,902. Concrete Mixer. Geo. E. McArthur, Eaton Rapids, Mich.

843,087. Brick Molding Machine. Thowald G. Jensen., Kimbalton, Iowa.

843,176. Machine for Molding Building Blocks. Simon H. Rickard, Allegheny, Pa.

843,193. Floor and Art of Laying Same. Thos. Cantwell, Providence, R. I.

843,278. Concrete Mixer. Elmer E. Jackson, Fremont, O.

843,314. Burial Vault. Willie K. Waters, Buffalo, N. Y.

843,524. Reinforced Cement Block. Edward J. Brooks, East Orange, N. J.

843,417. Building Blocks. Paul Odson, Stoughton, Wis.

843,424. Reinforcing Bar for Cement and Like Material.

843,436. Fence Post. Andrew Bowers, Stroud, Okla.

843,683. Metal and Concrete Structure. Hans Monnhardt, Chicago, Ill.

843,768. Concrete Building Construction. Albert S. Reavis, Washington, D. C.

843,843. Concrete Building Construction. Albert S. Reavis, Washington, D. C.

843,878. Process of Calcining Lime and Cement Forming Material. Carleton Ellis, White Plains, N. Y.

843,937. Making Concrete Walls. John L. Given, Tompkins Cove, N. Y.

843,950. Method of Making Concrete Walls. Eli Martin, Detroit, Mich.

844,204. Tool for Cement Work. Ralph L. Sohn, Arrowsmith, Ill.

844,234. Mold. Herman Besser, Alpena, Mich.

844,235. Molding Machine. Herman Besser, Alpena, Mich.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Claremont, Cal.—Special. Edwin Squire, C. E. and surveyor, says this town has recently been incorporated as a city of the sixth class. It is the seat of Pomona College.

Milwaukee, Wis.—City engineer Poetsch and commissioners Schoenecker and Jansen, of the board of public works, have been investigating Kettle River sandstone and creosoted paving blocks.

Peoria, Ill.—The annual report of Col. John Warner, inspector of sidewalks, shows that three miles of cement sidewalks and two miles of brick sidewalks have been laid during the year.

Houston, Tex.—Local press reports state that "if a deal now pending with the Texas Company can be consummated, Houston's asphalt streets may be repaired with asphalt obtained in refining crude petroleum."

Rockford, Ill.—Official compilations of city engineer Hand show that a total of 16,687-ft. of macadam has been constructed during the last year at a total cost of $25,776.75, and at an average cost of $1.54 per foot.

Muskogee, Ok.—The city council canceled its contract with the Cleveland-Trinidad Paving Company, Dec. 17, refusing to accept its bonds, and drafted a petition to the governor of the state to make Muskogee a city of the first class.

Salt Lake City, Utah.—This city has constructed, during the last year, 15-mis. of cement sidewalks.

CONTEMPLATED WORK.

Duluth, Minn.—Paving is contemplated for 4th st.

Wausau, Wis.—Macadam paving is contemplated for Fulton st.

Averyville, Ill.—Plans are being discussed for improving Fairholm st.

Waycross, Ga.—Voted to issue $40,000 bonds for street paving, Dec. 3.

Neenah, Ia.—Plans are being prepared for paving Wisconsin ave. with brick.

Savannah, Ga.—Specifications have been prepared for paving McDoogle st. with asphalt blocks.

East Peoria, Ill.—The improvement of N. Main and E. and W. Washington sts. is contemplated.

Reading, O.—Plans have been approved for resurfacing the principal streets of this village.

Bloomington, Ill.—A resolution has been adopted to pave E. Clay st., from Gridley to State.

Des Moines, Ia.—Brick paving is contemplated for W. 10th st. Action will be taken Jan. 6.

Freeport, L. I., N. Y.—The bd. of trustees has decided to expend $54,000 in street improvements.

Iowa City, Ia.—This city contemplates paving several streets next spring. Chas. S. McGowan, cy. engr.

Independence, Ia.—Brick paving is contemplated for several streets. A. D. Guernsey, cy. engr.

Hannibal, Mo.—Plans are being prepared for about 1-mi. of brick paving. August Scheineman, cy. clk.

Jacksonville, Fla.—Resolutions were adopted Dec. 17 providing for the paving of more streets.

Crookston, Minn.—The construction of about 3-mis. of cement sidewalks is contemplated next year.

Omaha, Neb.—The county board is considering the question of using concrete and Tarvia on county roads.

Oroville, Cal.—The merchants are endeavoring to secure asphalt paving for the principal business streets.

Guthrie, Ok.—The city engineer has been directed to submit plans for paving Noble ave. Mayor Barnes.

Olean, N. Y.—The bd. of supvrs. authorized, Dec. 11, the building of the State road from here to Portville.

Evansville, Ind.—The question of paving Fontain ave. from Fulton ave. to State st. with brick is under consideration.

Glen Gardner, N. J.—The residents have voted to incorporate this village and to improve the streets and sidewalks.

Ft. Wayne, Ind.—Bids will be asked about Jan. 8 for constructing 13 1-3-mis. of macadam road. Geo. W. Lindermuth, co. audt.

McKinney, Tex.—The Commercial Club is discussing the question of paving the public square and certain business streets.

Moberly, Mo.—Plans will be started soon for constructing 3-mis. of brick paving on sand foundation. S. McDonald, cy. engr.

Baton Rouge, La.—A. Swart, cy. engr., estimates the cost of the proposed paving of Main st. and North Boulevard, at $12,000.

Red Wing, Minn.—Council is considering the use of brick and other paving material for use in the work proposed for next spring.

Peoria, Ill.—Estimates are being made by Chas. Dolan, cy. engr., for resurfacing Adams st. from Hamilton to Cedar, with asphalt.

Pittsburg, Kas.—Plans are being prepared for 14,000-sq. yds. of brick paving and 1,200-ft. of stone or concrete curbing. O. T. Jones, cy. clk.

New Orleans, La.—Plans and specifications have been prepared for paving Short st. and constructing banquettes on Moss st. W. J. Hardee, cy. engr.

Ottawa, Ill.—Local press reports state that the bids received recently for paving on the East Side have been rejected and new bids will be asked.

Ft. Scott, Kas.—Bids will be asked for soon for brick paving on N. Crawford and Wall sts. and macadam paving in National ave. Wm. McElroy, cy. engr.

Zanesville, O.—An ordinance was passed, Dec. 9, for grading, paving and constructing a concrete retaining wall and tile drain in 9th st. from Main to Marietta.

Joplin, Mo.—The macadamizing of Cox ave. and construction of concrete sidewalks on Virginia, Pennsylvania and Kentucky aves. and Empire st. is contemplated.

Kirksville, Mo.—Bids will be asked soon for constructing about 3-mis. of vitrified brick street paving. Plans are being prepared by Tyler Paine, cy. engr.

Springfield, Ill.—Action on the proposed paving of Glenwood ave. from Edwards to Canedy sts., and Canedy st. from College st. to Lawrence ave. has been postponed until Jan. 2.

Chicago, Ill.—Ordinances have been approved for paving Maxwell and Lock sts. and Greenwood, Lexington and Woodlawn aves. with asphalt, and Wentworth ave. with granite blocks.

Buffalo, N. Y.—Special. Common council has directed the commissioner of public works to prepare plans and ask for bids for repaving Rhode Island st. from Niagara st. to Richmond ave., and ordered the paving of Carroll st., from Hydraulic to Van Rensselaer sts. with round edge shale brick, Exchange st. from Hamburg st. to Indian Reservation line, with Medina sandstone on concrete base, and Hamburg turnpike, from Buffalo river to Buffalo creek R. R. with Medina sandstone on concrete base.

CONTRACTS TO BE LET.

Little Rock, Ark.—Bids are asked until Jan. 2 for improving W. 12th st. Gerhard Morgan, engr.

Lebanon, Ind.—Sealed bids are asked until Jan. 6 for constructing gravel roads. B. F. Simmons, co. audt.

Paoli, Ind.—Bids are asked until Jan. 7 for constructing a road in French Lick twp. Alvin B. Ham, co. audt.

Ft. Washington, Md.—Bids are asked until Jan. 10 for resurfacing macadam roads at this post. Constr. Q. M.

Knox, Ind.—Bids are asked until Jan. 10 for constructing 14-mis. of gravel roads. Lee M. Ransbottom, co. audt.

Noblesville, Ind.—Bids are asked until Jan. 11 for grading, draining and graveling 2 roads. N. W. Cowgill, co. audt.

Danville, Ind.—Bids are asked until Jan. 6 for grading, draining and macadamizing 14,598-ft. of road. D. D. Mills, co. audt.

Lewiston, Idaho—Bids are asked until Jan. 16 for constructing the J. Roth road in Road Dist. No. 8. W. L. Gifford, cy. clk.

Ridgefield, Conn.—Bids are asked until Jan. 2 for grading and graveling a section of road. Geo. H. Whitlock, 1st selectman.

Fayetteville, Tenn.—Bids are asked until Jan. 2 for constructing concrete paving. W. G. Kirkpatrick, cons. engr., Jackson, Miss.

Sidney, O.—Bids are asked until Jan. 4 for building the Brandewe pike, 23,216-ft. long, in McLean twp. Chas. Counts, co. audt.

Cleveland, O.—Sealed bids are asked until Jan. 4 for grading, draining and paving Dille road. Julius C. Dorn, clk. co. comrs.

Irvington, N. J.—Bids are asked until Jan. 7 for constructing 2000-ft. of new or second-hand cross walks. M. Stockman, town clk.

Hammond, Ind.—Sealed bids are asked until Jan. 3 for constructing concrete cement sidewalks in Cedar st. John L. Rhode, chmn. B. P. W.

Crownpoint, Ind.—Bids are asked until Jan. 6 for constructing gravel roads

on Ruff roads Nos. 1 and 2. Chas. A. Johnson, co. audt.

Vincennes, Ind.—Sealed bids are asked until Jan. 7 for constructing gravel roads in Decker and Vincennes twps. John T. Scott, co. audt.

Logansport, Ind.—Bids are asked until Jan. 6 for constructing gravel roads 23,760-ft. long in Deer Creek twp. George W. Cann, co. audt.

Montgomery, Ala.—Bids are asked until Jan. 6 for asphalt and brick paving, sidewalks, sewers, etc., in Hull st. A. R. Gilchrist, cy. engr.

Monticello, Ind.—Bids are asked until Jan. 6 for grading, draining and paving with gravel a road in Prairie twp. J. L. Ackerman, co. audt.

Fort Hamilton, (Brooklyn P. O.) N. Y.—Bids are asked until Jan. 15 for grading and removing stone wall. Capt. Chas. T. Baker, constr. Q. M.

East Liverpool, O.—Bids are asked until Jan. 4 for 30,000-cu. yds. of grading on a highway between here and Lisbon. R. G. Boyd, chmn. bd. comrs.

Washington, Pa.—Bids are asked until Jan. 17 for constructing improved roadbed, culverts, bridges, etc., on Dry Run road. Wm. Wylie, co. rd. engr.

Santa Monica, Cal.—Bids are asked until Feb. 15 for constructing 2000-sq. yds. asphalt paving on concrete, curb, etc. Thos. H. James, cy. engr.

Virginia, Minn.—Bids are asked until Jan. 7 for constructing 6-mis. of roadway from Crane Lake, Portage to Pelican. W. A. James, clk. Town of Buyck.

Columbus, Ind.—Sealed bids are asked until Jan. 7 for constructing free gravel roads in Wayne twp. W. O. Clark, chmn. co. comrs.; John M. Davis, co. audt.

Versailles, Ind.—Bids are asked until Jan. 7 for constructing about 3-mis. of macadamized road upon Otter Village and Michigan road, Center twp. Nicholas Volz, co. audt.

Salt Lake City, Utah—Sealed bids are asked until Jan. 3 for 60,000-cu. yds. of grading, 17,000-lin. ft. curbing, and 41,-000-sq. yds. of asphalt paving. F. J. Leonard, chmn. B. P. W.

McKeesport, Pa.—Bids are asked until Jan. 7 for paving sundry streets with brick, with curbing, grading, etc. C. E. Soles, cy. controller.

Patchogue, L. I., N. Y.—Plans, specifications and bids are asked until Jan. 14 for constructing a driveway along the bay front between Rider and Cedar aves. J. Fred Flugrath, vil. clk.

Jersey City, N. J.—Bids are asked until Jan. 2 for furnishing 2500-yds. of broken stone 2 1-2 to 1 1-2 sizes; 1000-yds. road gravel, Roa Hook, Shark river, or equivalent; 1000-yds. Pike county shale. John C. Sweeney, clk. comrs.

Billings, Mont.—Sealed bids are asked until Feb. 4 for constructing 86,653-sq. yds. macadam paving, 3000-lin. ft. sewer, 12-manholes, 15-catchbasins, 17,-400-lin. ft. gutter, and 6306-sq. yds. of shale brick paving. J. D. Matheson, cy. clk.

Erie, Pa.—Sealed bids are asked until Feb. 4 for State st. extension, consisting of a public steamboat landing at Port of Erie about 548-ft. long and 100-ft. wide, including dredging, timber, cribs filled with rock, filling between cribs, concrete walls and brick pavement. M. H. Taylor, chmn. Erie Dock Comn.; H. T. Leasure, secy.

CONTRACTS AWARDED.

Toledo, O.—H. P. Streicher & Co., of Toledo, will lay 6325 sq. yds. of bitulithic in this city.

Portland, Conn.—The contract for grading and improving E. Main st. was awarded to Samuel Nelson.

Riverside, Cal.—The contract for grading 4th st. was awarded Dec. 10, to the McIntyre Cement Co., for $11,-235.

Lockland, O.—John Ryan was awarded the contract, Dec. 9, for constructing a cement sidewalk in Patterson st.

Mesa City, Ariz.—The contract for constructing concrete walks and gutters was awarded to M. L. Vieux, of Phoenix, for $3500.

Danville, Ind.—The contract for constructing 6600-ft. of gravel road was awarded to Hick Scurry, of this city, for $3170.

Chehalis, Wash.—Anderson & Robinson secured the contract for macadamizing Park, School, Washington and Adams sts. for $8500.

Logansport, Ind.—The contract for constructing 7-mis. of gravel roads was awarded to Daniel Mahony, of Cass county, for $20,650.

Eugene, Ore.—2,834 sq. yds. of bitulithic will be laid by the Warren Construction Co. of Portland, Ore., in this city.

Portland, Ore.—An additional contract for 15,802 sq. yds. of bitulithic has been awarded to the Warren Construction Company.

Des Moines, Ia.—The Flint Brick Co. was awarded contracts for paving 6 streets with brick at prices ranging from $1.38 to $2.15 a sq. yd.

Olympia, Wash.—The contract for grading State Aid road No. 4, King county, was awarded, Dec. 14, to L. H. Goerig, of Seattle, Wash., for $19,-700.

Fremont, O.—George Kinney submitted the lowest bid, Dec. 16, for paving Depot st., at $6294.20 for Metropolitan block and $6396.20 for Wassal block.

Fort Worth, Tex.—The Texas Bitulithic Company of Dallas, Tex., has been awarded a contract for 114,940 sq. yds. of bitulithic.

Salem, Ore.—An additional contract for 14,429 sq. yds. of bithulithic has been awarded to the Warren Construction Co., of Portland, Ore.

Port Arthur, Ont.—The Warren Bituminous Paving Co., of Toronto, Ont., has been awarded a contract for 6,593 sq. yds. of bitulithic.

Winston, N. C.—A contract for 72,-000 square yards of bithulithic has been awarded to the Atlantic Bitulithic Company of Richmond, Va.

Birmingham, Ala.—Southern Bitulithic Co., of Nashville, Tenn., has received an additional contract for 2500 sq. yds. of bitulithic.

Fargo, N. D.—The contract for paving the approach to the south bridge with creosote blocks on plank foundation was awarded to James Kennedy, Dec. 5, for $3263.

Lake Providence, La.—Special. The contract for constructing about 4-mis. of concrete walks and curbing was awarded, Dec. 17, to John Houchins, of Jackson, Miss.

Vancouver, Wash.—A contract for 36,987 sq. yds. of bitulithic is being constructed by the Warren Construction Co., of Portland, Ore.

Toronto, Ont.—An additional contract for 2,432 sq. yds. of bitulithic has been awarded to the Warren Bituminous Paving Co., of this city.

Grand Rapids, Mich.—The contract for paving the Ann st. bridge with creosoted wood blocks was awarded to the Wycoff Pipe & Creosoting Co., of Stamford, Conn., for $4728.

Wenatchee, Wash.—The contract for grading, curbing, parking and constructing sidewalks on Chelan ave., was awarded to John Connor and the Eagle Livery Co., for $14,999.

Cincinnati, O.—The L. Drach Construction Co., was awarded the contract, Dec. 5, for paving Valencia st. with brick, and T. Strack the contract for paving St. Lawrence st.

Columbia, S. C.—The contract for paving Main st. was awarded to the Georgia Engineering Co., of Augusta, Ga., for $173,560.19. The street will be paved with vitrified brick.

Springfield, Ill.—J. F. Bretz was awarded the contract for paving N. Grand Ave. with brick with asphalt filler, at $1.69 a sq. yd. for paving and 55 cts. a lin. ft. for curbing.

Bloomington, Ill.—The contract for paving Lumber and Livingston sts., at the approach to the C. & A. Olive st. subway, with brick was awarded to O. W. Dunlap, for $1087.20.

Kingston, Pa.—The boroughs of Kingston and Edwardsville awarded a contract for paving Slocum st., which divides the two places, as follows: Kingston portion, A. H. Coon; Edwardsville portion, D. M. Rosser.

Bloomington, Ill.—I. D. Lain was awarded the contract, Dec. 2, for paving Walnut st. with brick, with combined concrete curb and gutter, at $1.69 a sq. yd. for paving and 43 cts. a lin. ft. for curb and gutter.

Syracuse, N. Y.—The contract for paving N. Salina st. with asphalt was awarded to F. J. Baker, for $40,445.92; paving E. Kennedy st. with asphalt, Central City Paving Co., $8,620.30; paving Solar st. with Syracuse block, Samuel Bonn, $4,000.20.

Mexico City, Mex.—Contracts for improving all the land lying between the Cuauhtemoc Glorieta to Chapultepec, on both sides of the Paseo de la Reforma, by constructing paving and sewers in the new streets, were awarded to the Compania Sancaria De Obras Y Bienes Raices, and the Compania Mexicana De Asfalto.

Tacoma, Wash.—The Barber Asphalt Paving Co., 114 Liberty St., N. Y. City, was awarded a contract, Dec. 12, for paving Steele st. with asphalt, for $61,400. F. A. Keasel, of this city, secured the contract for paving So. 19th, 21st, 23rd and 24th sts. up the hill from Pacific ave., excepting 21st st. to Tacoma ave., with sandstone blocks for $146,200.

McKinney, Tex.—Contracts for paving in front of the business places of the Colin County Implement Co. and the J. T. Couch Music Co. with vitrified brick have been awarded to a local construction company. This is the first paving work constructed in the history of this city, and the question of paving the public square and adjacent streets is being considered by the residents.

Brooklyn, N. Y.—Th contract for repaving Irving ave. and Harmon st. with asphalt on concrete base was awarded to the Barber Asphalt Paving Co., 114 Liberty st., N. Y. City, as follows: 11,800 sq. yds. asphalt pavement, $1.25; 100 sq. yds. old stone pavement, relaid, 40 cts; 1,660 cu. yds. concrete, $5.85; 3,130 lin. ft. new curb in concrete, $1.33; 2,500 lin. ft. old curbs reset in concrete, 83 cents; total $31,516. The Brooklyn Alcatraz Co., 407 Hamilton ave., was awarded the contract for repaving Skillman st. with asphalt on concrete, as follows: 7,370 sq. yds. asphalt pavement, $1.25; 10 sq. yds. old stone pavement, to be relaid, 40 cts; 1,020 cu. yds. of concrete, $5.90; 3,685 lin. ft. of new curb set in concrete, $1.25; 1,840 lin. ft. old curb, reset in concrete, 75 cts.; 22 noiseless covers and heads, complete, for sewer manholes, each $18; total, $21,617. The Uvalde Co., 1 Broadway, N. Y. City, secured the contract for repaving Ten Eyck st. with asphalt on concrete, as follows: 8,400 sq. yds. asphalt pavement, $1,27; 30 sq. yds. old stone pavement relaid, 40 cts.; 7,175 sq. yds. concrete, $5.90; 3,840 lin. ft. new curbs, set in concrete, $1.30; 1,200 lin. ft. old curbs to be reset in concrete, 80 cts.; 24 noiseless covers and heads, complete, for sewer manholes, each $18; total $23,715.

Harrisburg, Pa.—Bids for constructing 5280-ft. of state road in Londonderry twp., Dauphin co., were received Dec. 16, as follows: W. S. Sides & Co., Middletown, Pa., $14,419, native stone bottom, limestone top, c. i. pipe; D. J. Rogers, Danville, Pa., $16,398, native stone bottom, limestone top; $16,000, native stone bottom and top, cor. pipe; W. M. Goode & Co., Lancaster, Pa.; $13,566, native stone throughout; $14,903, native stone bottom, limestone screenings top, cor. pipe; United Ice & Coal Co., Harrisburg, Pa., $11,497, naive stone throughout; $11,651, native stone stone throughout, cor. pipe; $12,951, native stone throughout, Birdsboro Co., Harrisburg, Pa., $11,497, native stone bottom, Birdsboro trap top, cor. pipe; $12,773, native stone bottom, native stone and limestone mixed in equal parts for second and top courses; J. L. Fraser Co., Philadelphia, Pa., $12,629, material not specified, cor, pipe; The Maryland Co., Philadelphia, Pa., $13,974, local stone bottom, local stone top, cor. pipe; $15,225, local stone bottom, Birdsboro trap top, cor. pipe. The contract for constructing 3200-ft. of state highway, including 525 ft. of brick paving, at Enhaut, Pa., was awarded to the Maryland Co., of Philadelphia.

SEWERS.

Atlanta, Ga.—During the last year 8 3-10-mis. of sewers have been constructed at a total expenditure of $87,002.80.

CONTEMPLATED WORK.

Delta, O.—Voted to issue bonds for a sewer.

Lancaster, Pa.—Bids will be asked next spring for constructing sewers.

Chester, Pa.—Bids will be asked for soon for constructing a sewer in Central ave.

Newark, O.—Plans have been prepared for sewers in Pataskala and S. 5th sts.

Mt. Pleasant, Ia.—The construction of sewers in sundry streets is contemplated.

Mineral Wells, Tex.—Voted to issue bonds for sewer purposes.

Galva, Ill.—Plans are to be prepared for a sewer system.

Waycross, Ga.—Voted to issue $20,000 bonds for the extension of the sewer system.

Erie, Pa.—Plans are being prepared for constructing an intercepting sewer in 19th st.

Harrisburg, Pa.—City council has approved plans for constructing 3 sewers.

Chester, W. Va.—Plans are being prepared for a sewerage system for the Chester Improvement Co.

Columbia, Miss.—Voted to issue bonds for constructing a sewerage and waterworks system.

Mountain Home, Ida.—This city advocates the construction of a sewerage and water-works system.

Burlington, N. C.—Voted, to issue bonds for constructing a sewerage and water-works system.

Kirksville, Mo.—Bids will be asked for building 2 district sewer system. J. C. Carothers, cy. clk.

Janesville, Wis.—The construction of a main outlet sewer is contemplated. C. V. Kerch, cy. engr.

Mount Olive, N. C.—Bids will be asked for constructing a sewerage system next spring.

Excelsior Springs, Colo.—An ordinance was passed Dec. 12 for constructing sewers in dist. No. 14, in Forest Park.

Sterling, Kans.—Plans are being prepared for the construction of a sewerage system. D. J. Fair, mayor.

Binghamton, N. Y.—The necessity for enlarging several trunk sewers will be considered in January.

Duluth, Minn.—A new outlet is proposed for the Woodland Park sewer system. Thos. McGilvray, cy. engr.

Elmhurst, Cal.—The Elmhurst Board of Trade is interested in a movement to establish a sanitary district.

Aberdeen, Wash.—Bids are asked until Jan. 8 for the purchase of $30,628.37 sewer bonds. P. F. Clark, cy. clk.

Ottumwa, Ia.—Bids will be received next spring for constructing sewers in sundry streets. J. T. Brady, cy. engr.

Hartford, Conn. — Appropriations have been authorized for constructing sewers in Ann st. and Homestead ave.

Ashtabula, O.—The state bd. of health will consider Jan. 20, the plans for a sewerage system for the west end of this city.

Webb City, Mo.—This city contemplates the construction of a vitrified pipe and cement sewer. L. O. Walker, cy. clk.

Mars, Pa.—Council advises the construction of a sewerage system and the question will probably be voted on soon.

St. Paul, Minn.—Plans for constructing a sewer system in Hastings ave., and Point Douglas have been completed by L. W. Rundlett, cy. engr. The system will be more than 1-mi. in length and will be built of concrete.

Dublin, Ga.—Will vote Jan. 8 on the question of issuing $25,000 for the extension of the sewerage and waterworks system.

Zanesville, O.—An engineer will be engaged to make plans for the completion of the sewer systm in Putnam sewer dist. No. 2.

Fort Dodge, Ia.—The bids submitted for constructing sanitary sewers were rejected and new bids will be asked. W. T. Evans, town clk.

North Andover, Mass.—This city will have a new sewerage system if the state bd. of health approves the plains prepared by E. W. Bowditch, of Boston.

Logansport, Ind.—Plans are being prepared for 3½-mis. of brick and pipe sewer, and bids will be asked in the spring. J. G. Schmidt, cy. engr.

Columbia, S. C.—Special. A. E. Legare, C. E., 1422 Main st., advises us that he desires catalogues of sewerage and water-works specialties.

Albuquerque, N. Mex.—James N. Gladding, cy. engr., has submitted a report to city council outlining the necessity of a new sewerage system for this city.

Springfield, Mo.—The city engineer has been directed ot prepare plans and estimates for constructing a system of surface drainage or storm sewers.

McCook, Neb.—Special. C. H. Meeker advises us that he has completed plans for a sewerage system at Ft. Morgan, Colo., to cost about $75,000. Bids will be asked soon.

South Orange, N. J.—The question of appropriating $7500 for the construction of a storm water sewer from the Orange Park to South Orange ave. will be submitted to vote next spring.

Everett, Wash.—W. E. Sutton, cy. engr., is preparing plans for a complete rearrangement and unification of the city's sewerage system. The plans will be ready in th spring.

Moberly, Mo.—Plans will soon be prepared for 4 district sewer systems, to be of 18-in. vitrified pipe with brick manholes and about 40 manhole covers. J. F. Curry, cy. clk.

St. Louis, Mo.—Plans for constructing a sewerage system in Wyoming st. dist. No. 21, to be known as the Glaze Creek sewer, have been prepared. A. J. O'Reilly, prest. B. P. I.

Niagara Falls, N. Y.—Plans for a tunnel trunk sewer for the relief of the factories east of Echota have been approved.

Cameron, Tex.—This city will engage a civil engineer of Dallas, Tex., to make estimates of the cost of a sewerage system, after which bids will be asked for the work of construction.

Kutztown, Pa.—The state bd. of health has advised this borough that it must provide a method of disposing of its sewage, on account of the danger of contaminating the water supply of Reading.

Ft. Wayne, Ind.—Plans have been completed for a 4-ft. sewer in Lakeside Park addition, 1-mi. long, to be of brick or reinforced concrete pipe, and bids will probably be asked about Jan. 1. F. M. Randall, cy. engr.

Chicago, Ill.—The bd. of local improvements of Morton Park approved, Dec. 23, the proposed construction of a 6-ft. sewer 5-mis. long, extending from Austin to the drainage canal. The sewer will cost $248,000.

CONTRACTS TO BE LET.

Rockwell City, Ia.—Bids are asked until Jan. 2 for constructing a tile drain in dist. No. 25.

Hanley Falls, Minn.—Bids are asked until Jan. 6 for constructing sewers. J. M. Hardy, vil. recdr.

Cincinnati, O.—Bids are asked until

Jan. 3 for constructing 2 culverts. Fred Dreihs, clk. B. P. S.

Ft. Dodge, Ia.—Bids are asked until Jan. 14, for constructing drainage ditch No. 40. H. S. Solm, co. audt.

Ft. Wayne, Ind.—Bids are asked until Jan. 2 for constructing sewers. H. W. Becker, clk. B. P. W.

Orland, Ill.—Bids are asked until Feb. 8 for constructing a drainage ditch in Orleans twp. Town clk.

Benson, Minn.—Bids are asked until Jan. 21 for constructing ditch No. 9. Michael Romstad, co. audt.

Montgomery, Ala.—Bids are asked until Jan. 6 for constructing storm water sewers in Hull st. A. R. Gilchrist, cy. engr.

Maxton, N. C.—Bids are asked until Jan. 15 for constructing sewerage and water-works systems. J. M. Bandy, engr., Laurinburg.

Clinton, Ia.—Bids are asked until Jan. 14 for constructing 3500-ft. of 12 to 36-in. pipe sewers. Chas. P. Chase, engr.

Durango, Colo.—Sealed bids are asked until Jan. 6 for building 3 sanitary sewers in sewer dist. No. 1. Herman Berndt, mayor.

Steubenville, O.—Sealed bids are asked until Jan. 13 for constructing sewers in 5th st. and an alley. T. W. Vance, clk. B. P. S.

Council Bluffs, Ia.—Bids are asked until Jan. 9 for constructing sections 1 and 2 of the Avoca tile drain. W. C. Cheyne, co. audt.

Creston, Ia.—Bids are asked until Jan. 7 for furnishing steel pipe, cement, etc., for sewers during the year. W. F. Craig, co. audt.

Salt Lake City, Utah—Sealed bids are asked until Jan. 3 for constructing pipe sewers in sewer extension No. 191. Louis C. Kelsey, cy. engr.

Redwood Falls, Minn.—Bids are asked until Jan. 10 for digging and constructing tile branches to ditches Nos. 3 and 4. L. P. Larson, co. audt,

Jefferson, Ia.—Bids are asked until Jan. 3 for furnishing vitrified drain tile 6 to 22-ins. and for excavating trenches, laying tile and refilling trenches. E. S. Gose, co. audt.

Colorado Springs, Colo.—Bids are asked until Jan. 15, for driving about 14,000-ft. of deep drainage tunnel and sinking 600-ft. of shaft in the Cripple Creek Mining Dist. E. D. Marr, secy., Colorado Springs.

Fredonia, Kas.—Bids are asked until Jan. 15, for constructing a sewerage system and septic tank. R. S. Spencer, cy. clk.

Greenville, O.—Bids are asked until Jan. 25 for constructing ditch No. 642 in Allen and Brown twps. Jas. R. Marker, engr.

Hammond, Ind.—Bids are asked until Jan. 3 for constructing a 15-in. vitrified pipe sewer in Garfield st. John L. Rhode, chmn. B. P. W.

Canton, O.—Bids are asked until Jan. 3 for constructing storm sewers in E. 4th st. and branch sewers in several streets. W. E. Sarver, cy. engr.

Billings, Mont.—Sealed bids are asked until Feb. 4 for constructing 3000 ft. of sewer, 12 manholes, 15 catchbasins, etc. J. D. Matheson, cy clk.

Manila, P. I.—Bids are asked until Jan. 19, for furnishing and installing electrically driven pumps and motors for the new sewer system. J. F. Matheson, cy. clk.

Hot Springs, S. D.—Bids are asked for furnishing and delivering pipe. W. A. Ticker, treas. Battle Mountain Sanitarium, N. H. D. V. S., Hot Springs.

McKeesport, Pa.—Bids are asked until Jan. 7 for constructing a sewer at No. 4 fire station, a 24-in. terra cotta sewer in W. 6th, and 15-in. terra cotta sewers in Beech st. C. E. Soles, cy. controller.

Springfield, O.—Bids are asked until Jan. 2 for constructing a high level sewer in Main, Light, North and Factory sts. and Western ave., requiring reinforced concrete and vitrified pipe sewers, Y branches, manholes, etc. W. H. Sieverling, cy. engr.

Boston, Mass.—Sealed bids are asked util Jan. 6 for constructing section 6 of the Boston marginal conduit and section 4 of the Boston embankment, requiring 18,000-cu. yds. earth fill, 29,000-lin. ft. piles, 200-cu. yds. concrete masonry, 240-cu. yds. stone masonry, 400-tons of riprap, the removal of about 600-cu. yds. of masonry, and 3 cofferdams. Henry S. Pritchett, chm. Charles River Basin Comn.

CONTRACTS AWARDED.

Mingo, O.—Ferry & Neville secured the contract for constructing a trunk sewer for about $50,000.

Santa Monica, Cal.—The contract for constructing a storm drain in Main st. was awarded to J. D. Kneen, of that city.

Chattanooga, Tenn.—The contract for constructing the new Grand View sewer was awarded to Bosler & Flynn, for $29,260.48.

Crawfordsville, Ind.—The contract for constructing a drainage ditch was awarded to S. G. Maxwell, of Smartsburg, for $2689.75.

Dayton, O.—The contract for constructing sanitary sewers in North Dayton was awarded Dec. 6, to John T. Rees, for $72,898.

Dallas, Tex.—The contract for constructing 20,000-ft. of sanitary and storm sewers was awarded to the San Antonio Sewer Pipe Co., Dec. 7.

St. Paul, Minn.—Thornton Bros. were awarded the contract, Dec. 19, for constructing about 2-mis. of sewer on Dayton's Bluff, for $37,883.

Baton Rouge, La.—The contract for erecting an electrical sewerage station was awarded to Krumbhaar & Aiken, of New Orleans, for about $3200.

Morristown, N. J.—The contract for the erection of the disposal plants for the sewerage system on the Whitnall tract was awarded ot J. B. Salmon.

Springfield, O.—The contract for constructing a reinforced concrete high level intercepting sewer was awarded to Cyrus M. Long, for $73,369.70.

Evansville, Ind.—The contract for constructing the 7th ave. sewer was awarded to the Heuman-Vineyard Plumbing Co., at 69 cts. a lin. ft., $30 for inlets, and $23 for manholes.

Winfield, Kas.—The Municipal Construction Co., of Kansas City, Mo., was awarded the contract for constructing sewers in districts Nos. 2 and 3, for $5400 and $2200 respectively.

New York City—The contract for the extension of sewers in Main, Hamilton and Fulton sts. to the line of the new dock was awarded to the Crescent Construction Co., for $1074.

Auburn, N. Y.—The bids submitted Dec. 3 for constructing sewers in the 4th, 5th, 6th and 7th wards and for purification works, were rejected. The

total amount of the bids for the sewers ranged from 121,743.10 to $290,983.60. and for the purification works only two bids were received, at $42,328.75 and $47,036.30 respectively.

New York City—The contract for constructing the Bronx Valley trunk sewer was awarded, Dec. 9, to the Mack Paving & Construction Co., of Philadelphia, for about $1,800,000.

St. Paul, Minn.—John Lind was awarded the contract for constructing a sewer in Armstrong st. for $7600, and O'Neill & Preston the contract for a sewer in Stickney, Gates and Page sts. for $12,457.

Galveston, Tex.—Bids for constructing a reinforced storm drain were submitted as follows: Regular section, $13,839; special section, $1,400; catch basins, $464; manholes, $40; concrete, $372; timber, $1,620; total, $17,736.

Louisville, Ky.—Bids were submitted Dec. 17, for constructing section "B" of the southern outfall sewer, contract 2, as follows: T. B. Jones & Co., St. Louis, Mo., $296,524; Henry Bickel, Louisville, $336,681; E. H. Abadie & Co., Times Bldg., $352,674; Kirshener Construction Co., Cincinnati, Ohio, $370,175; Westwater & Casey, Dublin Pike, Columbus, Ohio, $385,070; New York Continental Jewell Filtration Co., 15 Broad st., New York, N. Y., $597,-352; American Engineering & Construction Co., Chicago, Ill., $404,627; E. G. Nave Bro. & Co., Portsmouth, Ohio, $415,240; Irwin Bros., Greenville, Ohio, $416,393; Metropolitan Construction Co., 95 Milk st., Boston, Mass., $439,723; Luck Construction Co., Roanoke, Va., $522,306.

WATER WORKS.

Harrodsburg, Ky.—This city has purchased the water-works plant owned by the Mercer Water Co., for $36,-000.

Kenosha, Wis.—The annual report of the Municipal Water Co., shows that the profits for the year amount to more than $23,000.

Spencerport, N. Y.—The Spencerport Water Co., has been incorporated by Chauncey Brainard, of this city, and H. Mortimer Robertson and Wm. H. Link. of Herkimer, N. Y.

CONTEMPLATED WORK.

Franklin, Minn.—A new water-tower is proposed.

Rockton, Ill.—A water-works system will be installed.

Toppenich, Wash.—A water-works system is contemplated.

Vallejo, Cal.—A new reservoir site and lake is proposed.

Yuba City, Cal.—Voted to install a municipal water-works system.

Delta, O.—Voted to issue bonds for constructing a water-works system.

Waycross, Ga.—Voted to issue $10,000 bonds for water mains extension.

Morehead, Ky.—The construction of a water-works system is contemplated.

Mountain Home, Idaho—The construction of a water-works system is advocated.

Council Bluffs, Ia.—Council is considering the question of a municipal water plant.

Corliss, Wis.—The establishment of water-works and electric light plant is contemplated.

Eldorado, Ark.—Bids will probably be asked next spring for constructing a water-works system.

Lynder, Wash.—Voted to construct a water-works system and bids will be asked next spring.

Oswego, N. Y.—A resolution has been passed locating a pumping station on the lake shore.

Madison, S. D.—Special. W. A. Boyd is in the market for 2 80-h. p. boilers, high pressure.

Princeton, Mo.—Plans are being prepared for a system of water-works. J. C. Lomax, cy. clk.

Childress, Tex.—City has decided to install a water-works system. Joseph H. Aynsworth, secy.

Burlington, N. C.—Voted to issue bonds for building a water-works system. A. F. Barrett, mayor.

Berlin, Ont., Canada—This city contemplates the extension and improvement of its water-works system.

Dallas, Tex.—The water dept. contemplates laying water mains in the southwest section of the city.

Elgin, Ill.—The question of this city purchasing water meters for the consumers is under discussion.

Washburn, N. D.—The Commercial Club has under consideration the construction of a water-works system.

Speeds Addition, Miss.—Voted Dec. 2 to construct a municipal water-works system. J. W. Hayes, mayor, Vicksburg.

Fairchance, Pa.—Bids will be received about March 1 for constructing water-works. Jas. Farrell, clk. coun.

Kenosha, Wis.—The bd. of water commissioners has decided to build a new intake pipe for the municipal water system.

Fernie, B. C.—A committee of three has been appointed to secure plans and estimates for a municipal water system.

Denison, Tex.—Bids will be asked in January for constructing a reservoir dam. Hiram Phillips, cons. engr., St. Louis.

Grand Rapids, Mich.—Plans and specifications are being prepared for a new pump to be installed at the pumping station.

Hayes, S. D.—Residents of this town will appeal to congress to construct wells and dams for a water storage system here.

Lebanon, Tenn.—Dr. H. K. Edgerton is chairman of the committee to have control of the expenditure of the water-works fund.

Guthrie, Ok.—Mayor Barnes has been authorized to advertise for bids for a filtration plant with sedimentation basins, etc.

Malmo, Neb.—The village bd. has appointed a committee to investigate the cost of installing a water-works system and electric light plant.

Springfield, Ill.—Ordinances were passed, Dec. 9, providing for the construction of a new water-works dam and the proposed subway at Eastman ave.

Columbia, S. C.—Special. A. E. Lagare, C. E., 1422 Main st., advises us that he desires to receive catalogues of water-works and sewerage specialties.

Marquette, Mich.—The municipal board will engage a sanitary engineer to advise upon the improvement of the water supply here, which is being polluted by sewage.

Oakland, Cal.—Mayor Mott has signed the ordinance appropriating $40,000 for the first payments in the construction of the proposed auxiliary salt water system for fire purposes.

Aberdeen, Wash.—The bids submitted for supplying 16-in. water pipe for the Charley Creek pipe line were returned to the bidders unopened and new bids will be asked. Chairman Ingram, of special com.

Jersey, City, N. J.—A resolution has been passed directing Chas. Van Keuren, ch. engr. water bd. to prepare plans and specifications for 2 36-in. water mains to be laid under the Hackensack and Passaic rivers.

Montreal, Que., Canada—City council decided, Dec. 18, to appoint three consulting engineers to report on the pumping capacity of the city's waterworks at Point St. Charles and whether or not it will be necessary to purchase another pump to supply water this winter.

Medicine Lodge, Kas.—Special. This city is considering the matter of changing its water-works plant from a Holly and syphon system to gasoline or some other power and a stand-pipe, with probably other improvements. No engineer has yet been on the ground.

CONTRACTS TO BE LET.

Las Animas, Cal.—Bids are asked until Feb. 1 for constructing waterworks. W. R. Murphy, cy. engr.

Maxton, N. C.—Bids are asked until Jan. 15. for constructing a waterworks system. R. M. Williams, mayor.

Phoenix, Ariz.—Bids are asked until Jan. 10 for laying c. i. water mains. Robt. A. Craig, supt. water dept.

Rockwell City, Ia.—Bids are asked until Jan. 6 for constructing a 4-in. water main. I. E. Dougherty, town clk.

Wood River, Neb.—Bids are asked until Jan. 15 for constructing a waterworks system. D. D. O'Kane, vil. clk.

Tucson, Ariz.—Bids are asked until Jan. 8 for constructing a water-works system. Frank S. Treat, cy. clk.

Fargo, N. D.—Sealed bids are asked until Jan. 6 for constructing a 6-in. water main in 8th st. N. C. Morgan, cy. audt.

Aurora, Ill.—Bids are asked until Jan. 17 for a new air compressor for the pumping station. M. J. Tarble, cy. engr.

Morris Plains, N. J.—Bids are asked until Jan. 9 for furnishing water pipe, tees, etc. Geo. W. Jagle, chmn. com. on supplies.

Winnipeg, Man.—Sealed bids are asked until Jan. 15 for furnishing 15-mis. of assorted water pipe. M. Peterson, secy. bd. control.

Annapolis, Md.—Bids are asked until Jan. 14 for a water pipe system here. Bureau of supplies and accounts, Navy dept., Washington, D. C.

Ft. Wayne, Ind.—Bids are asked until Jan. 6 for the purchase of 4 tubular boilers, now in service at the city water plant in N. Clinton st. B. P. W.

Toronto, Ont.—Bids are asked until Jan. 28 for a 15,000,000-gal. and 6,000,000 gal. engine for the main and high-level pumping station. C. H. Rust, chmn. bd. control.

Guthrie, Ok.—Bids are asked until Jan. 7 for establishing a filtration system and furnishing 8, 4 and 6-in. c. i. water pipe. for extension of mains. C. M. Barnes, mayor.

CONTRACTS AWARDED.

Cullom, Ill.—The contract for installing new water mains was awarded to Kingdon & Kingdon, for $7475.

Hancock, Md.—Arthur Geiser, of N. Y. City, and Henry P. Bridges, of Baltimore, who have the franchise for a water-works system here, have completed plans for the water-works system and for a complete sewerage system.

Atlanta, Ga.—The contract for constructing the proposed vertical, triple-expansion pump for the waterworks system has been awarded to the Wisconsin Engine Co., of Corliss, Wis., for $133,700.

Cumberland, Md.—The contract for a Prescott Corliss cross compound crank and fly-wheel pumping engine was awarded to Fred M. Prescott Steam Pump Co., of Milwaukee, Wis., for $23,-410.

Altoona, Pa.—The contract for furnishing Blair county with 3½-mis. of 4-in. c. i. pipe and 4-tons of oakum to lay same was awarded to W. H. Goodfellow Sons, of this city, for $5658.

Woodland, Cal.—The contract for furnishing 23,000-ft. of pipe, iron gates, crosses, tees, etc., needed in the extension of the water-works system was awarded to J. A. MacMurray, of this city, for $7,999.

Ft. McKenzie, Wyo.—The contract for constructing an additional water main from Sheridan reservoir to the Ft. McKenzie reservoir, was awarded to Tiersway & Achle, of Denver, Dec. 15, for $46,000.

Los Angeles, Cal.—The contract for furnishing and laying a riveted steel penstock for the Los Angeles aqueduct was awarded to the Lacy Mfg. Co., for $18,500.

Newton, Miss.—The contract for constructing a water-works system was awarded as follows: Ahrens & Ott Mfg. Co., New Orleans, cast iron pipe and specials, valves, boxes and hydrants, $13,365.05; A. M. Lockett & Co., New Orleans, pumps, connections and valves, erection of all machinery except deep well pump, feed water heater and wrought iron pipe, valves for boiler and pump connections, and asbestos cover, $3,805; P. H. Porter, Clinton, Ky., foundation for tank and tower construction of reservoir and pipe line $7,152.75; L. R. Sperry, New Mexico, deep well and pumping outfit and sinking well, $1,600; Enberg Electro and Chemical Works, St. Joseph, Mich., Enberg electro hydraulic $175; J. F. Mercer, erecting building for plant, $5,339.36.

BRIDGES.

Fremont, Neb.—Bids are asked until Jan. 15 for erecting bridges. G. O. Boe, co. clk.

St. Charles, Mo.—Bids are asked until Feb. 13 for erecting Cuivre river bridge at Old Monroe. Co. comrs.

Le Roy, N. Y.—Bids are asked until Feb. 1 for building a bridge over Oatka river. Philo J. Sperry.

Brookings, S. D.—Bids are asked until Jan. 8 for constructing all county bridges during next year. Co. comrs.

Geneva, Neb.—Bids are asked until Jan. 14 for erecting all county bridges. W. Peterson, clk. co. supvrs.

Castle Haynes, N. C.—Bids are ask-

ed until Jan. 7 for constructing a steel bridge. D. McEachern, Wilmington.

Salem, S. D.—Bids are asked until Jan. 7 for building all bridges in McCook county during the next year. C. J. Black, co. audt.

West Union, O.—Bids are asked until Jan. 3 for building the superstructures of bridges over 2 creeks. Co. audt.

Redfield, S. D.—Bids are asked until Jan. 10 for constructing all bridges constructed next year. W. J. Bingham, co. audt.

Dunnellon, Fla.—Bids are asked until Jan. 8 for constructing a steel bridge across Blue river. S. T. Sistrunk, clk. co. comrs.

Colfax, La.—Bids are asked until Jan. 6 for constructing a steel bridge over Big Creek and Fish Creek. J. B. Roberts, clk. Police Jury.

Ocala, Fla.—Bids are asked until Jan. 8 for building a steel bridge across Withlacooche river at Stokes Ferry. S. T. Sistrunk, clk. co. cmrs.

Attala, Ala.—Bids are asked until Jan. 6 for constructing a steel bridge to replace Rhea bridge. Etowah Co. comrs., Gadsden.

Nashville, Tenn.—Bids are asked until Jan. 22 for constructing a number of steel spans. H. M. Jones, engr.; J. K. Rains, chmn. Cumberland River Bridge Com.

Greensburg, Ind.—Bids are asked until Jan. 7 for building a bridge over Clifty creek, and for the repair of a bridge on the Path Pike. Frank E. Ryan, co. audt.

Hammond, Ind.—Bids are asked until Jan. 6 for building a swing bridge over Calumet river at Columbia ave. Samuel A. Love, Chmn. co. comrs.; Chas. A. Johnson, co. audt.

Bridgeport, Conn.—The Congress st. bridge com. has recommended the construction of a reinforced concrete bridge with a double-lift steel draw. R. M. Berrien, ch. engr.

Milwaukee, Wis.—The bd. of pub. wks. has been directed to contract for the construction of a concrete viaduct over the Kinnickinnic river at Highland boulevard, and a steel bascule bridge over the Kinnickinnic river at Kinnickinnic ave.

STREET LIGHTING.

Warsaw, Ind.—A municipal light plant is proposed.

Malmo, Neb.—An electric light plant is proposed.

Linden, Mich.—The question of street lighting is under consideration.

Corliss, Wis.—The establishment of an electric light plant is contemplated.

Newburg Heights, O.—Bids are asked until Jan. 7 for street lighting. P. S. Ruggles, vil. clk.

St. Joseph, Mo.—An appropriation is contemplated for laying conduits and cables in Felix st. Mayor Spratt.

Lecompte, La.—Bids are asked until Feb. 1 for constructing an electric light plant. Baldwin Wood, engr., New Orleans.

Wood River, Neb.—Bids are asked until Jan. 15 for constructing an electric light plant. D. D. O'Kane, vil. clk.

Silvis, Ill.—The contract for erecting a plant and furnishing electricity and gas for street lighting was awarded to W. H. Downing.

West Covington, Ky.—A franchise for furnishing gas to this city has been granted to the Union Light, Heat & Power Co., for 20-yrs. at $100 per annum.

Washington, D. C.—Bids are asked until Jan. 6 for furnishing engine and generator and switchboard to Isthmian Canal comn. H. F. Hodges, genl. purchasing agt.

Baltimore, Md.—The contract for gas and naptha lighting for 1-yr. was awarded to the American Street Lighting Co., Dec. 18, at $10.85 each for 7200 gas lamps and $25 each for 100 naptha lamps.

Crawfordsville, Ind.—City council has under consideration the sale of the city electric light plant, and also a proposition for furnishing the city with a new plant.

Newark, N. J.—James M. Seymour, Jr., has been engaged as consulting engineer to investigate conditions at the county jail and to determine the advantages to be gained by establishing an electric light plant there.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Columbus, O.—Bids are asked until Jan. 14 for designing, constructing and erecting garbage reduction works complete. E. F. McGuire, secy. B. P. S.

St. Paul, Minn.—Cy. engr. Rundlett is experimenting with powdered calcium chloride, sprinkling the streets with it, as an agent for laying the dust.

Providence, R. I.—Bids were submitted Dec. 10 for the removal of garbage, etc., for 5-yrs., as follows: (a) 1st year; (b) 2d year; (c) 3d year; (d) 4th year; (e) 5th year; (f) total: Chas. E. Clarke, Seekonk, Mass., (f) $120,000, payable in monthly installments of $2,000; T. A. Sampson, of Fall River, (a) $23,875, (b) and (c) $24,000, (d) $26,000, (e) $27,000, (f) $124,875; Jos. J. Nugent, Providence and Seekonk, (a) $25,000, (b) $25,597, (c) $26,625, (d) $27,739, (e) $29,000, (f) $133,961; Oneco Granite Co., Providence, (a) $27,900, (b) $35,250, (f) $142,150; Jas. H. Dillon, $28,850 each year, (f) $142,850; Herbert R. Durfee, Cranston, (a) $27,000, (b) $28,000, (c) $29,000, (d) $30,000, (e) $31,000, (f) $145,000; Geo. A. Field & Son Co., Cranston, (f) $150,000 in monthly installments of $2,500.

PARKS.

Washington, D. C.—An appropriation of $5,000,000 has been asked for the Appalachian park.

Columbia, S. C.—In its second annual report, the tree and park commission asked for money to carry on its work during 1908.

FIRE APPARATUS.

Bismarck, N. D.—The Commercial Club urges the purchase of a team and hose cart at once.

Briarcliff Manor, N. Y.—Special. Walter W. Law, Jr., village president, desires the names of automobile concerns which supply automobile apparatus for fire companies.